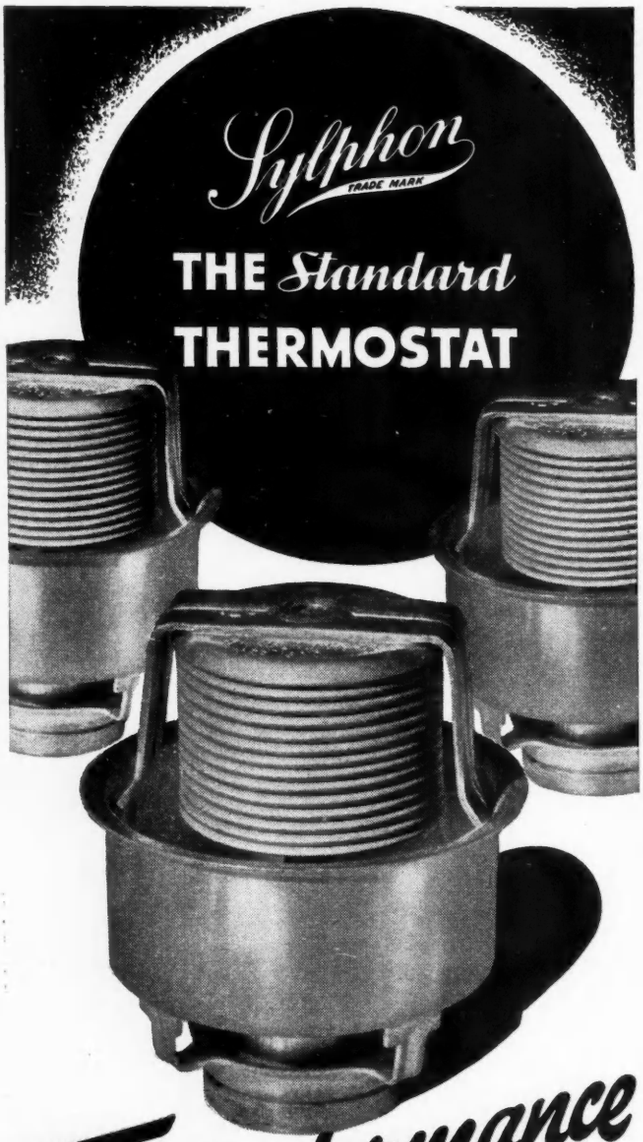

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The research and experience of the originators of the Sylphon Bellows and the pioneers and leaders in its application to temperature control—are reflected in the high standards of quality and dependability of Sylphon Automotive Thermostats. That is why they are preferred by leading automobile manufacturers.

THE FULTON SYLPHON CO.
KNOXVILLE, TENN.

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off
Published Weekly

Volume 80 Number 16

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CONTENTS

News of the Industry 509

Rear-Engined, Frameless Passenger Car. *By P. M. Heldt* 522

New York University Laboratories. *By H. E. Blank, Jr.* 526

Characteristics of Magnetically Actuated Fuel Injection Valve. *By C. J. Vogt and T. A. Rogers* 530

Features in the News

Summary of Production Activity
Advertising News Notes
Publications Available
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Advertisers' Index 54

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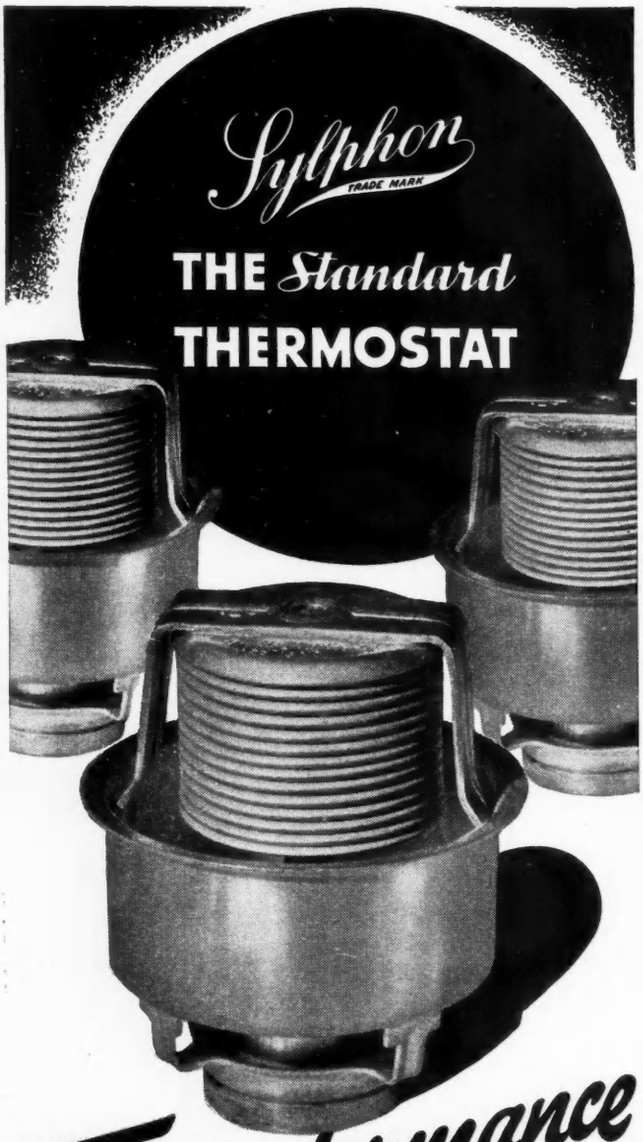

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AUTOMOTIVE INDUSTRIES

Vol. 80, No. 16

April 22, 1939

Expect April Output To Total 335,000 Units

About 84,000 Cars and Trucks Built This Week

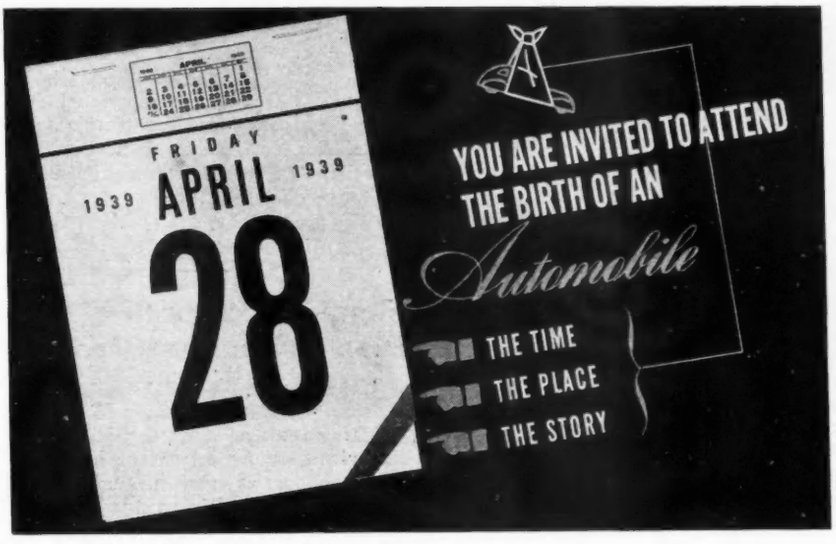
Car and truck production for the week ending April 22 was virtually unchanged from the rate in effect during preceding weeks with a mid-week check of schedules indicating that manufacturers would turn out between 83,000 and 84,000 units in the third week of the month.

On the basis of this week's estimate, total April production to date is placed at slightly more than 250,000 cars and trucks and with one week still to go there seems little question of the monthly total reaching the 335,000 figure previously mentioned unless there is a repetition of the schedule adjustment which took place at the end of March.

There has been little inclination to announce tentative estimates of May output although one major producer is reported to feel that the current rate of sales will justify continuance of approximately the same schedule now in effect.

There was no change in the relative standing of various manufacturers in the production totals for the current week. GM divisions were expected to turn out approximately 31,000 units, followed by Ford with slightly under

(*Turn to page* 513, *please*)



At Last!

With the broadside reproduced herewith, Powel Crosley, Jr. this week broke the news confirming persistent rumors that he would introduce a new small car on the American market. The Crosley car debut is set for April 28 at the Indianapolis Motor Speedway.

Reo's Annual Meeting Adjourned to April 26

The annual meeting of the Reo Motor Car Co., scheduled to be held in Lansing on April 18, was adjourned until April 26 to give time for checking of proxies in a recurrence of a contest for control of the company.

A group of stockholders led by Thomas Campbell of New York proposed to elect four new stockholders to replace part of the board recently elected by compromise when the com-

(*Turn to page* 513, *please*)

A Step Forward

IT is probably true that no business magazine stands higher in the esteem of its readers than does AUTOMOTIVE INDUSTRIES. The fact that this publication has earned and enjoyed the good opinion of those for whom it is edited has been convincingly and flatteringly evidenced over a long period by the uniquely large proportion of its readers who have renewed their subscriptions year after year. It is not making an immoderate statement to say that the informative and authoritative character of AUTOMOTIVE INDUSTRIES is, and for a long time has been, outstanding.

The self-justifying reputation of a publication is based on service rendered to its readers. In the case of AUTOMOTIVE INDUSTRIES, an acknowledged service of great value has been rendered to general executives, production men and engineers in all kinds of automotive manufacturing plants. It is the ambition of the editors to make that service of even greater value. To do that, extensive studies and investigations have been made to determine changes in reader habits, changes in reader needs and demands, changes in emphasis on various functional activities within the industry, changes in relative importance of industrial, production and engineering problems.

As a result of this intensive and protracted inquiry, we are now ready to announce that AUTOMOTIVE INDUSTRIES is about to take a long step forward in the advancement of reader interest and value.

Beginning May 1 next, AUTOMOTIVE INDUSTRIES, in each issue, will give its readers a greater volume of timely information, and a better interpretative presentation of current industrial and engineering developments. To accomplish this most effectively, it has been found desirable to increase somewhat the interval between issues in order that adequate opportunity may be provided for proper preparation of editorial material. AUTOMOTIVE INDUSTRIES will, therefore, beginning May 1 and thereafter be published on the first and fifteenth of each month.

The next issue of AUTOMOTIVE INDUSTRIES which readers will receive will be the first of the enlarged and improved semi-monthly issues, dated May 1.

Japan to Relax Restrictions On Automobile Parts Makers

"Qualified" Concerns Will Be Given Same Privileges as Munitions Manufacturers

Japan's thriving automobile parts industry has suffered a severe setback from the current munitions boom, as many manufacturers have turned to the production of aircraft parts and other war necessities, which promise ready cash at high profits.

In view of the fact that exports of parts and accessories provide every year a large amount of foreign exchange, which manufacture of aircraft parts does not, the authorities are now planning to discourage discontinuation of automobile parts manufacture and to give positive support to qualified makers. In particular, restrictions on supply of materials and capital funds, which have severely hamstringed the industry, will be abolished and firms will be given the same privileges as munitions manufacturers.

One of the largest Japanese parts making companies, Yokohama Motor Parts, has already applied for authorization to increase its capital from 300,000 yen to 3 million yen.

Nissan In Shanghai

With automobile sales to civilians practically suspended, Japanese motorcar manufacturers are attempting to exploit new business opportunities in China, where the army provides a large and profitable outlet.

Toyota has already built two assembling plants in strategic locations, and Nissan has now opened a 5-million yen branch plant in Shanghai.

General Motors is also trying to come in for a share of this business. Besides supplying cars direct, GM's Kwantung and Manchukuo agent has been authorized to "cover" Shantung Province in China also. A Nippon Kogyo report from Tsingtao indicates that control in the firm, to be known as Shantung Motors, will pass into Japanese hands.

German Ford, GM Cars

Envisaging increasing difficulties in importing cars and parts from their home plants, the Japanese assembling plants of Ford and GM are planning to fall back on their German sister firms.

The announcement of a new German-Japanese trade agreement is expected shortly, which may cut severely into American sales in Japan while opening new trade opportunities for German exporters.

Ford Japan has already imported and assembled a large number of Ford C model passenger cars, which are a product of the German Ford subsidiary. These models have not been seen in Japan for a considerable time.

Also the General Motors office in Osaka is said to be planning to assemble Opel cars and Blitz trucks to replace Chevrolets. Opel is the German GM subsidiary.

Australian Ball Bearings

Japan has recently imported fairly large amounts of ball-bearing steel balls from several points in Australia. The Australian Government Commissioner in Tokyo explained to AUTOMOTIVE INDUSTRIES' correspondent that the

(Turn to page 521, please)

Stewart-Warner to Show First Quarter Profit

The Stewart-Warner Corp. will show a profit of "somewhat more than $145,000" for the first quarter of 1939, J. S. Knowlson, chairman of the board, told stockholders at the annual meeting held April **12 in Richmond, Va.**

Federal Truck Volume Improves

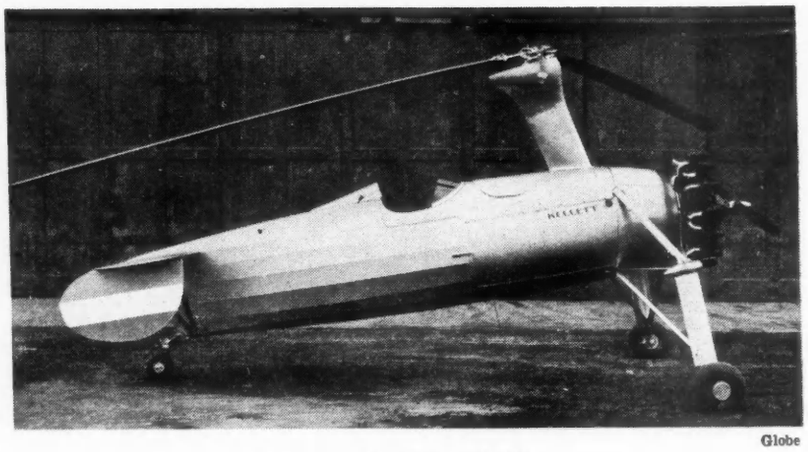
A sharp upturn in both orders and shipments is reported by K. M. Schaefer, general sales manager, Federal Motor Truck Co. "Our March orders were 18 per cent above February orders and 10 per cent above March, 1938," said Schaefer. He added that March shipments, due to completion of a large volume of the new ¾-ton models, were up 152 per cent over February; and 15 per cent over March, 1938. "From the standpoint of domestic orders, our March business was the best we have enjoyed since April, 1937," said Schaefer, "and from the standpoint of shipments the best month since June, 1937."

Allis-Chalmers Recalls Workers to Tractor Plant

Allis-Chalmers Mfg. Co., Milwaukee, has recalled 170 to 200 workers in its tractor works in West Allis to take care of increased tractor output. The works are at present producing 115 WC tractors, of the two-plow capacity, each day, and 120 of the Model B, a one-plow unit of low cost. About 50 men have been recalled to the plant in La Crosse, Wis., devoted to production of tractor implements. Total employment in all Allis-Chalmers in West Allis and other cities at present is 12,839, compared with 15,470 a year ago at the middle of April.

Load Limit for British Trucks

To take effect on July 1 next in the case of new vehicles and on Jan. 1, 1941, with respect to vehicles registered before next July, the British Ministry of Transport has issued new regulations having the object of preventing the loading of trucks beyond a limit set by manufacturers. Known as the "plating" regulations, they specify that every truck must have fixed to it by riveting or other form of permanent attachment a metal plate engraved with specified particulars, in-



Globe

Airport-to-Post Office

New Kellet wingless autogiro which is to be used by Eastern Air Lines, Inc., in executing its United States mail contract covering the six-mile, airport-to-post office route linking Central Airport, Camden, N. J., with the roof of the Philadelphia general post office. High speed is approximately 125 m.p.h. with low speed ranges from 25 m.p.h. to zero, depending on wind conditions. The autogiro will land without forward roll and take off with a forward run of less than 80 yards in still air.

cluding the safe maximum laden weight of the vehicle. There are penalties for permitting this weight to be exceeded.

The plates are to be issued only by manufacturers and a body to be known as the Vehicle Plates Committee appointed by the Ministry of Transport. The Committee will issue a plate for any vehicle only in the event of the manufacturers being unable or unwilling to do so, as in the case of a truck of which the makers have ceased to exist.

Plating is the chosen alternative to a change in the basis of truck taxation in England. At present the annual tax increases with the unladen weight and an operator is at liberty to carry any weight of load he chooses.

Overloading the class of truck weighing just under 5600 lb. (2½ long tons) with its tax of £30 and its legal speed of 30 m.p.h. is chiefly aimed at by these new regulations. It is frequently used to carry 6, 7 or more long tons, although sold for 4-5 ton loads, for if the next larger type is used it is restricted to a legal maximum of 20 m.p.h., as well as being subject to a higher tax. The alternative to plating considered by the Ministry of Transport, in consultation with representatives of manufacturers and operators, was taxation on the basis of maximum laden weight; but this was turned down as "likely to be less effective in gaining the desired end—the safety of other road users."

IHC to Remodel Milwaukee Plant

International Harvester Co., Chicago, is transferring the cream separator division from its large plant in Milwaukee to the branch factory in Richmond, Ind., to facilitate expansion of its foundry and Diesel engine and tractor divisions in Milwaukee. Remodeling of the Milwaukee plant at a cost of approximately $3,000,000 has just been put under way. Larger sizes of Diesel engines are to be manufactured. E. J. Leiser is general superintendent of the Milwaukee works.

California's Motor Caravan Tax Upheld

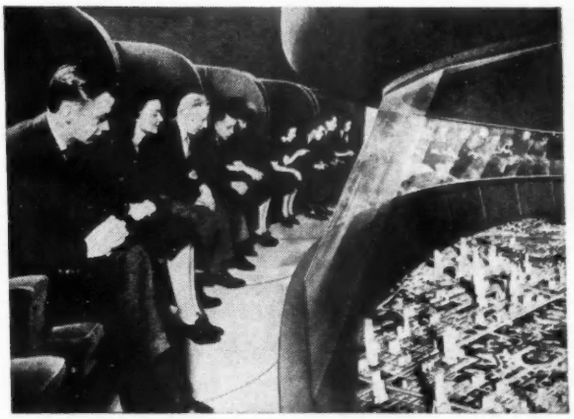
The Supreme Court on April 17 upheld the constitutionality of California's motor caravan tax act, which levies a license fee of $7.50 for each new car transported into the state on its own wheels or in tow of another car for sale within the state.

A Federal district court in Southern California had held the tax to be an illegal discrimination against interstate commerce not warranted by special services actually provided by the state for motor caravans. When Ray Ingals, former motor vehicle commissioner for California, appeared before the Supreme Court in appealing the lower court's decision, he contended that the imposition was non-discriminatory and that it merely recompensed the state for extra services performed as a result of highway use by the caravans.

Enacted in 1937, the law was designed to meet objections raised by the Supreme Court when it invalidated a similar tax imposed by a 1935 statute. The litigation originally was brought by a group of automobile dealers headed by Paul Gray, Inc.

"Carry-Go-Round"

Visitors to General Motors' "Highways and Horizons" exhibit at the New York World's Fair will view the world of tomorrow from moving chairs, as shown here, while touring a scale model of American countryside covering more than 35,000 sq. ft. and extending for a third of a mile of several levels of the building.



Acme

Rims Approved in March Increased 103% Over '38

A total of 1,730,211 rims were inspected and approved by the Tire and Rim Association in March, an increase of approximately 103 per cent over the total for March, 1938. For the first three months of 1939, the association has reported 4,886,883 rims inspected and approved, a gain of 163 per cent over the similar period of the previous year.

Chassisless Buses For London Streets

The London Transport Board, it is announced in England, has placed a large order with Metropolitan-Cammell of Birmingham for a chassisless type of double-deck trolley bus for use on existing tramcar routes with an overhead source of current supply.

Already London Transport has displaced hundreds of tramcars by trolley buses made by firms associated with the motor industry, and the latter is represented in the new chassisless type by the Associated Equipment Co., which will supply the running gear—axles, wheels, steering, brakes and other components corresponding with those of gas and oil engined buses. The English Electric Co. will supply the electrical gear.

These new buses will have seating for 70 passengers. The conventional chassis is displaced by an all-steel body under-frame, sides and front bulkhead, the superstructure following the lines of Metropolitan-Cammell standard all-metal double-deck bus bodies, which this concern has been producing for a number of years, though known chiefly as builders of railroad coaches and trucks.

It is said that the first examples of this chassisless type of bus show considerable saving in weight and appreciable reduction of overall height.

Lincoln Electric Co. Opens Duluth Office

The Lincoln Electric Co., manufacturer of arc welding equipment, Cleveland, Ohio, has opened a new office in Duluth, Minn. A stock of electric welders, electrodes and supplies will be maintained for serving the Duluth area. I. R. Bartter, formerly with the Minneapolis office of the company, will be in charge of the new branch.

Marquette Seeks Funds For New Engineering Building

Marquette University, Milwaukee, has undertaken a campaign to raise $1,000,000 for a new building for the college of engineering and for an endowment fund for the school in general. Provision will be made for 700 students in engineering, compared with 500 at present accommodated. The college has turned out a large number of engineers now associated with the automotive industry. Dr. Franz A. Kartak is dean of the college, which expects to occupy its new and enlarged quarters in September, 1940.

New California Laboratory For Ethyl Gasoline Corp.

The Ethyl Gasoline Corp. has just completed an engineering laboratory at San Bernardino, Calif., in order to extend its facilities for cooperative research with oil and automotive companies.

The San Bernardino Laboratory will supplement the work of the Ethyl Engineering Laboratory at Detroit. Among the many facilities there is included a gasoline testing laboratory, one of several which the Ethyl Corp. operates throughout the country.

AFL-CIO Contest for Control of Automotive Labor Front Looms

William Green Said to Have Offered Homer Martin Return of the UAW's Old Charter

Prospects of a contest between the AFofL and the CIO for domination of the automotive labor situation were heightened during the past week by negotiations between Homer Martin, president of the independent faction of the United Automobile Workers and William Green, president of the AFofL, paving the way for the return of the independent UAW to an affiliation with the AFofL.

The conference in Washington was said to have ended with an offer to Martin of the old charter under which the UAW was originally affiliated before it broke with the AFofL and lined up with John L. Lewis' newly organized CIO, with which another contingent of the UAW still is affiliated.

An early meeting of Martin's executive board was expected to consider the AFofL offer and to take steps for submitting the plan to the membership which will have to vote on the proposed affiliation before it can be accepted. Although it was reported that the independent UAW would be given wide jurisdiction under its AFofL charter there were certain questions as to possible limitations that might be placed upon it. First of all it is expected that pattern makers and tool and die makers would be excluded as actual or potential members of craft unions; and there also was some question as to the status under the proposed charter of workers in parts plants not controlled by vehicle manufacturers. It also is believed that the charter would exclude workers in the aircraft industry and farm implement industry in which the AFofL and UAW have been claiming jurisdiction.

Green is reported to have announced that the AFofL was restoring the old charter to the Martin UAW. Under this old charter the old UAW was told it could not take in workers in parts plants not owned by vehicle manufacturers.

Pending decision by the courts as to which faction of the UAW is the official party to present contracts, manufacturers generally are relying upon existing grievance machinery for settlement of disputes where there is no question of jurisdiction between factions; or are refusing to deal with either side, unless the other also is represented, where jurisdictional questions have been raised.

Latest development in this phase of the factional dispute took place at Buick where Harlow H. Curtice, president, notified employes that bargaining would be conducted on an individual basis through foremen until such a time as the company is advised of a bargaining committee in accordance with its contract. Curtice's action followed receipt of a notice from the independent UAW naming seven members of a committee to bargain for employes. This was interpreted as meaning that the company would have to bargain with two separate committees, which was held to be an impossible situation, making it necessary for the company to suspend all activities of committee men in its plants and substitute an arrangement whereby any employe may present a grievance to his foreman who will make every effort to arrive at a satisfactory understanding.

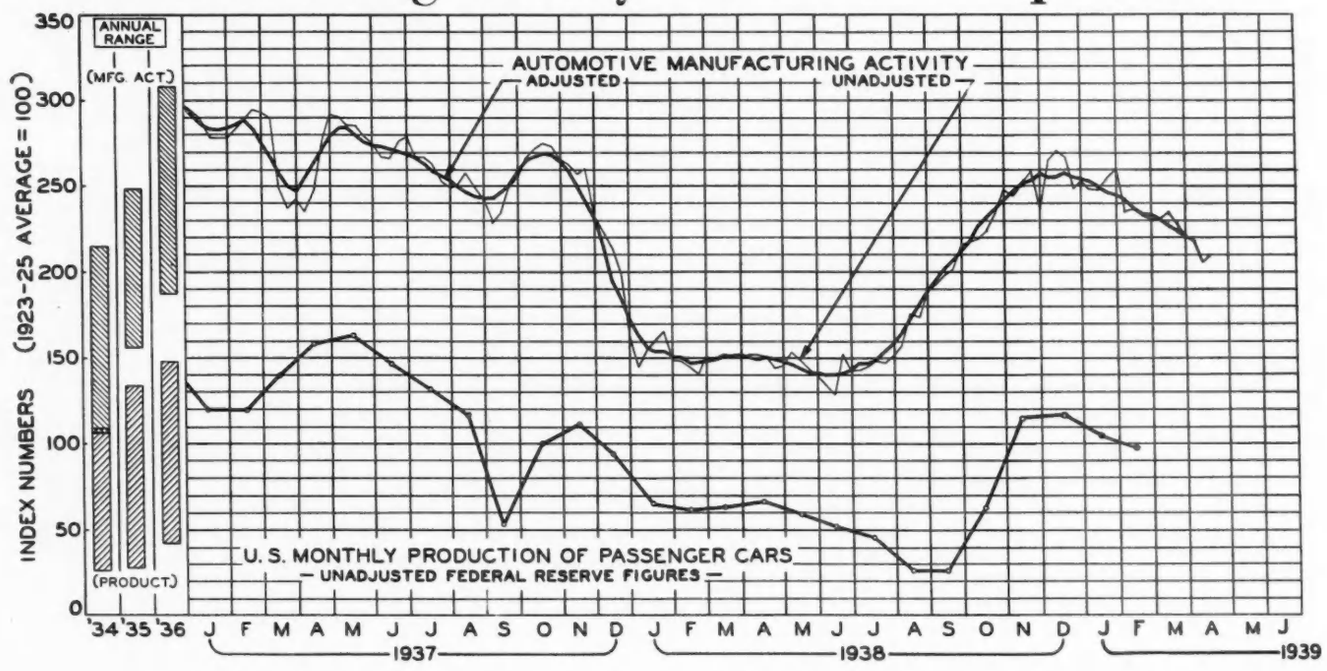
Discharges "Justified," Ford Counsel Tells NLRB

Counsel for the Ford Motor Co., argued in a brief filed with the National Labor Relations Board early this week that the company's Dearborn plant was justified upon legal grounds in discharging certain employes who were members of a union committed to the use of the sitdown strike.

Citing the Supreme Court decision in the Fansteel case, in which the sitdown was outlawed, the brief contended that since several discharged employes were members of the UAWA, which had utilized the sitdown technique, the company acted legally in discharging them.

The case dates back to May, 1937, when the NLRB charged the company

Manufacturing Activity Index Turns Up to 210



After dropping steadily for five weeks, the unadjusted index of automotive manufacturing activity reversed and climbed four points to 210 for the week ended April 15. The adjusted curve naturally continued its downward movement and for the week ended March 25 fell to 220.

with unfair labor practices following riots at the River Rouge plant. The case came to the Supreme Court last January on a technicality, the Court upholding the Board's contention that a circuit court of appeals had authority to remand cases to the Board for further proceedings. The NLRB had sought to remand the case, in order that it could take further steps to correct its administrative procedure.

Counsel for the company contended at that time that after a circuit court had acquired jurisdiction it had no power to remand the proceedings but must either directly comply with an order or have it set aside as invalid.

Production

(*Continued from page* 509)

21,000 and Chrysler with almost 20,000. Studebaker, Nash and Hudson continued to lead independents with schedules of 2800, 1600 and 1600, respectively.—J. A. L.

AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity
(Week Ending April 22)

BUSES Despite considerable interest in new equipment shown by large operators in recent weeks, there doesn't seem to be much placing of orders. Manufacturing activity shows very little fluctuation.

TRUCKS A broad study of army motorization, said to be a large expansion of the motor vehicle program already begun, is underway. Two large producers report a substantial increase in orders. One company, in fact, states that it is "still far behind on filling dealer orders."

TRACTORS Situation in farm tractor field remains about the same. Deliveries by dealers have been made to farmers capable of paying for their tractors. Much merchandise could be moved if farmers could make down payment. Weather conditions have been unfavorable to a large extent and general feeling among tractor men is that 1939 will be a fair year.

AUTOMOBILES Approximately 84,000 cars and trucks were produced this week. April's total will probably reach 335,000 units.

MARINE ENGINES Several large orders have been placed for lighter units by eastern boat builders, and a few heavy Diesel units have been delivered for fishing and work craft.

AIRCRAFT ENGINES Orders increasing slightly; all makers busy.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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February Financing Up Slightly Over January

Dollar volume of retail financing for February amounted to $81,914,862, according to a report issued by the Bureau of the Census, Department of Commerce. This is an increase of 0.2 per cent when compared with January, 1939; an increase of 17.7 per cent as compared with February, 1938; and a decrease of 21.3 per cent as compared with February, 1937. The volume of wholesale financing reported for February, 1939, amounted to $128,377,086, a decrease of 7.6 per cent when compared with January, 1939; an increase of 75.5 per cent compared with February, 1938; and an increase of 0.8 per cent as compared with February, 1937.

Abstracts

Farm Tractors In Great Britain

Farm tractors came into use in Great Britain only during the World War, when a national campaign for food production was inaugurated there, but even at the end of the great struggle there were only about 3000 such machines in service. At present the number of farm tractors in the United Kingdom is variously estimated at between 50,000 and 60,000. The bearing of this development on the production of food in the British Isles, especially in time of war, was discussed in a paper read on March 15 last before the Royal Society of Arts by S. J. Wright, M.A., director of the Institute of Research in Agricultural Engineering at the University of Oxford.

As an indication of the improvements in tractors since the time of the war, Mr. Wright mentioned that whereas during the war, in operations on 8500 acres in Kent, the cost of tractor maintenance, including spare parts but not depreciation, amounted to 8s. 8d. per acre, today this figure would cover the entire cost, including depreciation, fuel and labor, for tractors of comparable size. As a further evidence of technical improvement it was mentioned that the specific weights per drawbar hp. of wheeled tractors with kerosene or distillate engines decreased from 349 lb. in 1920 to 275 lb. in 1925, to 215 lb. in 1934, to 204 lb. in 1938, while the fuel consumptions per hp. hour at the rated load decreased from 1.63 to 1.15 to 1.05, to 1.00 lb.

The introduction of the tractor produced no fundamental changes in soil cultivation. The old standard implements, the plow, harrow and roll, remained unaltered in essentials. It was because the tractor traveled a little faster than the horse and could in an emergency maintain its full effort for an unlimited time, and because it enabled a man to control the equivalent of five or ten teams of horses at once that its actual influence on farming was much greater than any comparative cost figures would disclose.—*Engineering*, March 24.

Reo's Meeting

(*Continued from page* 509)

pany was placed under the jurisdiction of the Federal courts in connection with action for reorganization under Section 77-B of the National Bankruptcy Act. Dispute over the proxies presented led to an adjournment of the meeting. The Campbell faction charges that only two members of the present board have had automobile manufacturing experience.

Theodore I. Fry, trustee of the company recently appointed by the court, who was scheduled to submit a reorganization plan to the court on April 21, was granted an additional 30 days to prepare the plan.

Ourselves and Government —Corrected to April 13

FEDERAL TRADE COMMISSION

VS. UNITED STATES RUBBER CO. Counsel for respondents have filed an answer with the FTC in which they admit all the material allegation of the FTC complaint but point out that the United States Rubber Products Co., Inc., was wholly liquidated on Dec. 31, 1938, with United States Rubber Co. the successors; and that neither the company nor the U. S. Tire Dealers Corp. has operated any retail tire store or sold tires to so-called "commercial accounts" since Dec. 31, 1938. The FTC alleges unlawful price discrimination in the sale of tires in violation of the Robinson-Patman Act.

Pontiac's Early April Sales 73% Ahead of '38

Retail sales of Pontiac cars throughout the country for the first 10 days of April were 5138 compared to 2959 for the same period last year, an increase of 73 per cent. Sales also were higher by 28 per cent than the 4017 figure for the first 10 days of March.

New car inventories on April 10 were 28,512 which is 1209 less than the number of cars in dealers' stocks on the last day of March, indicating that sales are running slightly ahead of production.

Urges Government Impetus for Exploitation of Light Metals

Washington, D. C., Engineer Envisions Results in Engines That Will "Float"

It was reported to the Senate Military Affairs Committee last week that industry has barely scratched the surface in appraising and developing the potentialities of light metals. Willis G. Waldo, consulting engineer of Washington, who appeared in support of a proposal to establish a $25,000,000 aircraft engineering research center under the War Department, told the committee that the projected $1,500,000 appropriation for studying methods of improving the quality and reducing the cost of light metals and other structural materials would go far in stimulating the development of light metal resources by private industry.

It was his view that engineers in this country have for some time discounted the possibility of light metals other than aluminum and that they have, for the most part, been neglected. He proposed that the light metal industry be developed along the lines followed by the steel industry where, he said, "there is no monopoly, where a variety of different types of steel are produced and where the public gets the benefit of lower prices."

The witness referred specifically to lithium, which he described as light enough to float and having a specific gravity half that of water, and said that while it is used to a limited degree in Germany in the manufacture of aircraft it had found no commercial use in this country. He exhibited for the committee's information several light castings of the alloy manufactured in Germany, explaining that large scale production in that country had not materialized, presumably because of the metal's inability to stand up under stress.

On the other hand, alloys of beryllium, he said, have demonstrated properties for resisting fatigue and combinations of lithium and beryllium offer the possibility of combining the good features of both and providing a superior light metal alloy. Ores containing beryl, from which beryllium is obtained by electrolysis, are found on the Pacific Coast and some authorities say that the earth's crust contains more crude beryl than either lead or zinc.

Exhibiting a small sample of pure lithium and demonstrating its ability to float, Mr. Waldo told the committee that the world's largest supply is found in a 25-mile vein running between North and South Carolina although there are quantities of the ore in South Dakota, from which some has been shipped to Germany at a cost of $40 a ton. After manufacturing it, Germany has exported small quantities back to this country in the form of lithium chloride, used primarily in air conditioning work and costing at the rate of $40,000 a ton. Lithium from South Dakota is also purchased in small quantities by a New Jersey concern, which also makes chloride of lithium for refrigeration work.

In urging passage of the bill to establish the engineering center, Mr. Waldo expressed the view that by developing alloys containing lithium it may be possible by combining it with other alloys to give it the desired properties of an engineering metal, and may be used, for example, in the manufacture of engines so light that they can "float."

Lithium, the lightest of all metals, is alloyed with aluminum, beryllium and, to give it hardness, with lead. Beryllium is lighter and harder than aluminum but when alloyed with aluminum produces a lighter material, with a higher melting point and of greater strength. The high cost of production is generally credited with having prohibited its use commercially.

The witness, asserting that if Germany had the mineral resources of the United States it would organize a cartel to exploit the light metals beyond the stage of development reached thus far, referred to the Tennessee Valley as one spot in this country where he said that available mineral and power resources could be utilized to make in one operation smokeless powder and three light metals—magnesium, calcium and lithium.

Other developments brought to the committee's attention were that Japan plans to increase its production of magnesium 1000 per cent and that although Germany has no bauxite ore from which to make aluminum, that country's aluminum production—apparently reflecting the expansion of its aircraft industry—was increased more than 6½ times from 1932 to 1937.

The bill, whose passage was urged by Mr. Waldo, calls for a $25,000,000 appropriation for the aircraft engineering center to serve as a yardstick of determining cost of aircraft construction. In addition to the research station of chemistry, electro-chemistry and electro-metallurgy under the Bureau of Mines for exploring the field of light metals and other structural materials, it would authorize the Bureau of Standards, which would receive a $1,000,000 appropriation, to improve new physical and chemical processes in the interest of national defense.

Teamwork

Paul G. Hoffman, president of The Studebaker Corp., gave teamwork credit for the introduction of the new Studebaker Champion, when he spoke briefly on the "Americans at Work" program over a nationwide chain of the Columbia Broadcasting System. Ken Ellington, radio announcer with Chicago's WBBM, interviewed Mr. Hoffman, who is seated.

Steel Firm Offers $2,000 For New Air Speed Record

The Allegheny-Ludlum Steel Corp. has announced that a $2,000 cash purse and trophy would be awarded the Thompson Trophy Race winner who establishes a new speed record in the 1939 National Air Races at Cleveland, Ohio, this fall.

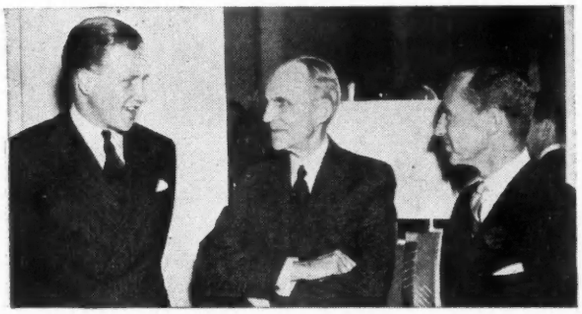
The Thompson Trophy Race, an international free-for-all, open to engines of unlimited cubic inch displacement, was won last year by Col. Roscoe Turner, who received the Allegheny-Ludlum Award for a speed of 283.419 m.p.h.

Buick Deliveries for First Quarter—46,675

Total Buick deliveries in the domestic market for the first three months of the year were 46,675 units, a new all-time high and comparing with 34,218 in the like 1938 period, a gain of 12,457 units or 36.3 per cent. The previous record first quarter was in 1926 when 44,935 cars were delivered.

Total deliveries for March were 20,959 units, compared with 12,712 in February, a gain of 65 per cent, and with 15,435 in March last year, an increase of 35.8 per cent.

A total of 15,421 used cars were sold by Buick dealers in the last 10 days while deliveries for the month reached the record-breaking total of 36,952. Against a used car stock of 34,927 units, this represents a turnover of less than 30 days.



Three Generations

Henry Ford, his son, Edsel, and Edsel's son, 22-year-old Henry Ford II, were caught by the cameraman when they met in New York recently to inspect the Ford Motor Co.'s Exposition at the New York World's Fair.

Tonnage of Automotive Steel Orders Continues to Taper Off

Mills Are Said to Have Enough Coal Stored to Permit Uninterrupted Operations Until May 31

While aggregate tonnage of automotive business on steel mills' order books continues to taper off, the from day-to-day flow of strip steel and sheets to automobile manufacturers and parts makers still constitutes the backbone of the billings of finishing mills. Nearly all of the business coming from automobile manufacturers is earmarked for nearby assemblies, and aside from the time required for the finishing process, receipt of specifications and shipment run almost neck-and-neck.

Uneasiness over the coal situation, lest this or that mill might be caught with an inadequate fuel supply, became a matter of concern this week. Leading steel companies were taking every precaution to conserve their stocks of coal, but at the same time inventories of coal in steel producers' storage showed that supplies were sufficient to permit uninterrupted operations until the end of May, should the deadlock between the coal operators and the miner's union continue that long.

Primary steel output in the Detroit area has been whittled down to slightly more than one-half of capacity, bringing the rate of production there into line with the ingot output for the country as a whole, which this week receded to 50.9 per cent, only slightly above the low of 50.7 per cent for the year, recorded during the first week of January. Although no one will hazard even a guess as to when try-out lots of steel for 1940 models will be called for, it is significant of the steel market's expectant state of mind these days that this has already become a topic of discussion.

A rather sharp advance in the tin market early this week was ascribed to the mounting cost of war risk insurance, but on Tuesday the market was a shade easier, spot Straits being offered at 47.50 cents, at which level there was some buying by consumers. Tin importers and brokers have come out with sharp criticism of the plan to barter cotton and wheat for tin. They contend that the United States should by all means build up an adequate strategic reserve of tin, but that some of the idle gold should be used to pay for it.

Copper can now be bought in the open market at 10⅛ cents, which is also the export price for the metal. Mine producers continue to quote 10¾ cents, while the leading custom smelter's price early this week remained at 10½ cents. Quite a little activity was noted on the New York Commodity Exchange as the result of political developments, but consumers are apparently satisfied to place their commitments for copper and brass products on the basis of actual needs. Both Japan and China were reported in the market for round tonnages of the metal.

Secondary aluminum is in good demand. It is interesting to note that aluminum scrap is now being brought here from Europe, the price paid by melters permitting ocean transportation. Aluminum appears to be the one metal that is in so good supply in Europe that no barriers are being raised against its being shipped out of otherwise metal-poor countries.—W. C. H.

ASTM to Change Method Of Publishing Standards

Modifications are to be made, according to an announcement from the headquarters of the American Society for Testing Materials, in the methods of publishing the Society's standard specifications and tests. These changes are to become effective November, 1939. The major change is to combine the Book of Standards (issued triennially) and the Book of Tentative Standards (issued annually).

The new method of publication will be to issue the standards and tentative standards collectively in one triennial publication, divided into three parts: Part I, Metals; Part II, Non-Metallic Materials—Constructional; and Part III, Non-Metallic Materials—General. Publication of new and revised tentative standards in the annual *Proceedings*, Part I, will be discontinued; the *Proceedings* including both committee reports and papers (about 1300 pages double column format) will be bound in one volume. The publication of the annual Book of Tentative Standards will be discontinued entirely. (The November, 1938, edition is thus the last one to be issued.)

In the two years between triennial publication of the new book, supplements to each of the three parts will be issued, containing revisions and new or revised standards and tentative standards for that year. Since these books will be appreciably larger than the present supplements and will have permanent reference value, they will be bound in cloth. The volume on Methods of Chemical Analysis of Metals published in 1936 will be continued as a separate publication.

Crude Rubber Consumption Increased 18.4% in March

Consumption of crude rubber by manufacturers in the United States during the month of March, 1939, is estimated to be 50,165 long tons, which compares with 42,365 long tons during February, 1939. March consumption shows an increase of 18.4 per cent over February and 64.5 per cent over March a year ago, according to statistics released by The Rubber Manufacturers Association, Inc. Consumption for March 1938, was 30,487 long tons.

This organization reports gross imports of crude rubber for March to be 38,989 long tons, an increase of 6.8 per cent above the February figure of 36,490 long tons, and 8.4 per cent above the 35,967 long tons imported in March, 1938.

Total domestic stocks of crude rubber on hand March 31 are estimated at 219,843 long tons, which compares with Feb. 28 stocks of 231,475 long tons and 299,172 long tons on hand March 31, 1938.

Crude rubber afloat to United States ports as of March 31 is estimated to be 55,981 long tons which compares with 55,814 long tons afloat on Feb. 28 and 41,882 long tons afloat on March 31 a year ago.

March **reclaimed rubber** consumption is estimated at 15,322 long tons, production 14,528 long tons, stocks on hand March 31, 19,955 long tons.

Willys-Overland Travels 1928 Miles at 80.3 M.P.H.

The 1939 Willys-Overland established an interesting record recently when a stock model was driven over a dry lake course at Rosamond, Calif., for a 24-hour period at an average speed of 80.3 m.p.h. Traveling 1928 miles in the 24-hour period, the car averaged 19.67 miles per gallon of gas, consumed six quarts of oil.

Men and Machines

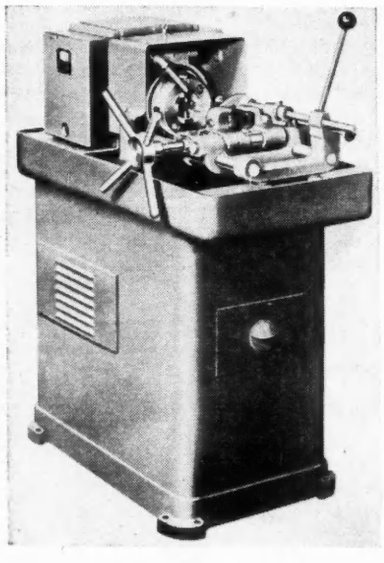
Index of Machine Tool Orders

By H. E. BLANK, JR.

Preserving the upward movement that began six months ago, the index of machine tool orders climbed in March to 185.4. The figures prepared by the National Machine Tool Builders' Association reveal the March index to be 18.3 points above February, 67.3 points ahead of last October's index when the trend upward started. In a report accompanying the release of these data, Frida F. Selbert, secretary of the Association, states: "The first quarter of 1939 shows a much better degree of participation in the business placed by all companies reporting than the last quarter of 1938. The improvement in domestic business brings with it a better distribution of new orders throughout the industry."

On April 24 and 25, the Association will hold its thirty-seventh Spring Meeting at Edgewater Beach and a fast-moving program is planned. John Abbink, president and general manager of the Business Publishers' International Corp., is scheduled to speak on "Combating Barter Trade in South America." Mr. Abbink recently returned from a tour of South American countries and his address is expected to be a vivid account of present-day conditions in a territory that few machine tool builders have visited.

Russell T. Kelley, a director of the Canadian Chamber of Commerce, will discuss industrial conditions in Canada. Other speakers include, Mrs. Selbert, who will present a survey of the machine tool outlook; J. Y. Scott, who is to give a report on "Profit Engineering"; and J. Carlton Ward, Jr., general manager of the Pratt & Whitney Aircraft Division of the United Aircraft Corp., who will talk on "The Airplane Engines of the Future."



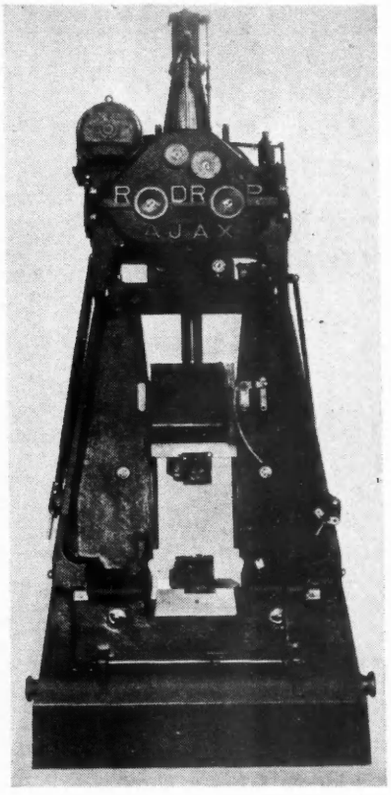
Oster bolt machine

Before we describe the new equipment brought to our attention in the past week we wish to pass along several items of "incidental intelligence." Purchase of the Gaterman line of tapping machines from the W. Gaterman Mfg. Co., Manitowoc, Wis., was just announced by Leonard J. Kaufman, president of L. J. Kaufman Mfg. Co., also of Manitowoc. In the future these tapping machines will be manufactured in the Kaufman Mfg. Co. plant.

A number of readers of *Men and Machines* probably will be interested in obtaining copies of either one or both of two new booklets. Michigan Tool Co. has packed a lot of useful data into the 32-pages of "Gear Cutting Tools." Information is given on selecting the right hob for the job; estimating roughing time; hob sharpening hints; tables of cutting speeds; spline shaft hobbing; hob limits; illustrations and specifications of standard and special hobs. Included also are tabular data and formulae for calculating gear tooth proportions as well as data on shaper cutters, burnishers, master gears and involute cutters. The other booklet we refer to is a complete catalog covering hand drivers and power bits for Phillips screws and also power screw driver bits for slotted head screws. Apex Machine & Tool Co., has prepared this manual which contains two tables for determining the correct bit size for Phillips wood, machine and sheet metal screws and stove bolts, and for flat, oval, binding and round head slotted screws.

Steering knuckles for a leading low-priced car are now being produced virtually complete (with the exception of machining the shank, and drilling and reaming king pin holes and brake drum flange holes) in three broaching operations. Using two broaching machines for each operation, production is at the rate of roughly 6 knuckles per minute with tolerances held to as little as 0.003 in. for spacing and squareness of faces.

Major sequence of operations is as follows: 1. Drill holes in brake drum flange. 2. Turn shank. 3. Rough and finish broach one side of 4 ears on brake drum flange. 4. Rough and finish broach outside and rough broach inside faces of 2 king-pin bosses. 5. Drill and ream king-pin hole. 6. Finish broach inside faces of king-pin bosses square with king-pin holes.



Ajax drop forging hammer

In the first broaching operation, the steering knuckle is located from the shank and dowel pins for the brake drum holes in a Colonial 10-ton, 48-in. stroke, Dual Ram hydraulic broaching machine with receding tables.

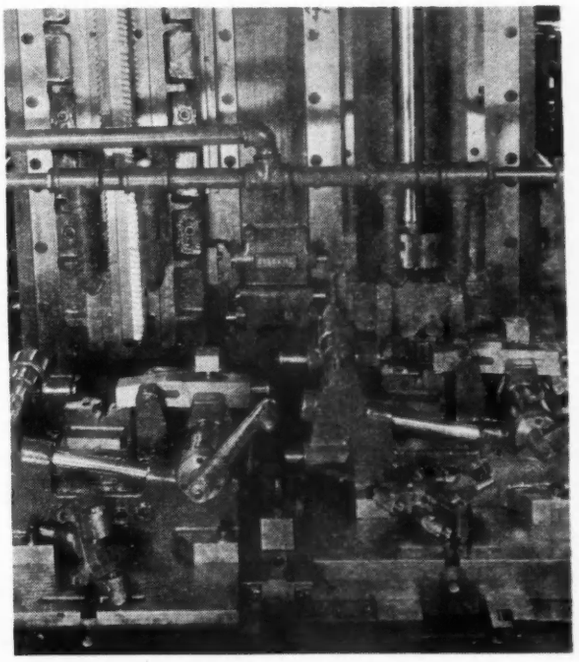
Broaching of the faces of the two king-pin bosses is carried out on a 25-ton Colonial dual ram hydraulic broach, with 60-in. stroke, two machines being used as in the first operation.

After drilling and reaming of the king-pin hole, the knuckles go to the final broaching operation—for finishing the inside faces. As shown in the illustration herewith, the knuckle is located from the shank in a half-round support, and cross-ways by pins through the kin-pin holes with which the faces must be square. These plungers are moved in and out by a crank. Bosses are supported during broaching by automatic plungers, as previously, but in this case they are actuated from the fixture instead of the ram.

As the locating plungers enter the

s Advances Again

March Figure at 185.4, an Increase of 18.3 Points Above February Mark and 67.3 Ahead of October, 1938



Colonial broaching machine set-up for finishing inside faces of steering knuckles

king-pin bosses, a clamp comes down on top of the knuckle, being mechanically operated from the same crank.

For this operation there is no trunnion, but the fixture is mounted on the receding table to permit continuous operation. Adjustment is provided in a crosswise direction for set-up compensation purposes. Again two machines are used, being Colonial Dual Rams of 6-ton capacity with 36-inch stroke. Production obtained is 340 pieces per hour from each machine.

A drop forging hammer operating on entirely new principles is being introduced by the Ajax Manufacturing Co., and was on exhibition at their plant in Cleveland during March.

Instead of boards for lifting the ram, a heavy square steel lift-rod, taper-fitted in the ram, and installed on the diagonal, is acted upon by rolls with rims built up of laminated friction material grooved to contact the rod on all four sides. Because of their transverse mounting, these friction rolls are of the head frame, and in consequence, have a wide arc of contact with the rod resulting in low unit pressures and negligible wear.

The rolls are brought into and out of contact with the lift rod through rocking of the eccentric hubs in which their shafts are carried by means of a small diameter air cylinder. A differential valve on the air line to this cylinder, governed by the amount the operator depresses the treadle controls the height to which the ram is raised before it is released, and makes it possible to strike blows of varied force—light, fast blows for fullering and heavy blows for finishing.

On full strokes the top of the lift rod is acted upon by an "accelerator cylinder" which is connected to the shop air line and gives the ram a quick acceleration or recoil so that heavier blows are struck and in quicker succession than if acted upon by gravity alone.

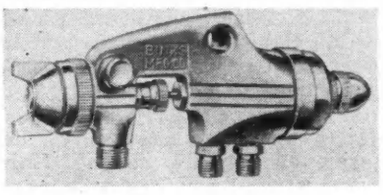
The lifting mechanism is driven from individual motor mounted on a spring cushioned platform through multiple "V" belts to a fully enclosed flywheel. The gearing which drives the rolls is entirely housed within a gear case integral with the headframe.

The steel columns are non-adjustably fixed to the steel base, which weighs 20 times the ram weight, and the insert type guides are adjusted to give perfect die match by means of calibrated wedges which are rigidly locked to prevent shifts.

A toggle action on the clamps which hold the ram in elevated position are released by exceptionally light foot pedal action. Performance of a hammer of this type in actual operation for practically a year indicates that several years' service can be expected of the renewable friction roll treads, and that production will run a substantial percentage above that of the ordinary type of drop forging hammers.

These hammers are being offered in a full range of standard sizes from 1500 lb. to 6500 lb., and larger upon request.

The increasing recognition of symmetry of form in machine tool design as being a practical sales asset, is attested by the streamlined bolt machine known as Rapiduction Junior, just announced by the Oster Manufacturing Co., Cleveland. In streamlining this machine, Oster engineers and Design Consultant Lawrence Blazey of Designers for Industry, Inc., Cleveland, New York and Chicago, were confronted with the fact that the chuck is off center, and their problem was to enclose the motor drive and gear-housing in a cast iron cover that offered a fair degree of symmetry.



Binks spray gun

Arriving at a practical basic design, the factors of accessibility of motor, suitable ventilation and an easily cleaned exterior were readily solved. To promote ease of operation and cleanliness, the lines of the holding jaw were simplified to eliminate grease and chip catching pockets. The new bolt machine is being made in two models, one of the bench type with drip-pan below, the other being on its own base as illustrated. It can be adapted for chamfering, drilling, reaming, boring, tapping and other jobs.

The new Thor Model No. 21 streamlined automatic spray gun was styled by Glenn W. Tammen of Designers for Industry, Chicago, Cleveland and New York. In cooperation with the engineering department of the Binks Mfg. Co., Chicago. Binks engineers in redesigning the old model No. 10, created radical improvements which eliminated dripping and spitting, and a positive action air plunger that gives spraying results equal to hand operated guns. Instead of incorporating these revolutionary improvements in the old model, a new design was wanted that would forcefully convey the thought of a new and greatly improved automatic spray gun. Conversely, by creating a factor of obsolescence in the old model by improved appearance, sales effectiveness was materially enhanced.

Lightweight hydraulic jack: Has a 50-ton rated capacity and is designed for use in locations too confined to admit a standard size unit. The jack is made of steel throughout and has an overall height of 6 in. and a lift of 2¾ in. Minimum space required for lifting cylinder is 5 in. by 6½ in. and maximum length 2 ft.-8 in. The Rochester Machine Co., Rochester, Pa., is the manufacturer.

Pace of Business Activity Sags Abruptly; Fisher Index at 79.8

An Exclusive and Regular Weekly Feature Written by the Guaranty Trust Co., N. Y.

Recession in general business activity was apparent last week. The index of the *Journal of Commerce* for the week ended April 8 dropped sharply to 79.3, as compared with 85.9 for the preceding week and 70.0 a year ago, reflecting chiefly, but not solely, the suspension of coal production in important fields pending the negotiation of a new labor contract.

Retail sales last week were from 3 to 7 per cent below those of the corresponding calendar week last year, according to estimates by Dun & Bradstreet. But during the preceding week, reflecting the spurt in Easter shopping, department store sales, as reported by the Board of Governors of the Federal Reserve System, rose to a level 22 per cent above that of a year ago.

Railway freight loadings dropped 11.4 per cent in the week ended April 8, owing chiefly to the coal strike.

Bituminous coal production that week averaged only 310,000 tons daily, as against 1,192,000 tons during the preceding week.

The output of electricity by the power and light industry in the same period declined more than seasonally, reducing the margin above last year's corresponding output to 9.2 per cent, as against 11.7 per cent in the week before.

Production of crude oil in the week ended April 8 averaged 3,443,900 barrels daily, as against 3,358,200 barrels in the preceding week and 3,392,350 barrels a year ago. Daily production requirements this month, as computed by the Bureau of Mines, are 3,434,000 barrels.

Debits to individual accounts by banks in leading cities during the week ended April 5 were 19 per cent above the total reported for the preceding week and very slightly above last year's corresponding amount.

Engineering construction awards during the first 15 weeks of the year total $939,000,000, the largest amount reported for this season in any year since 1929, according to *Engineering News-Record.*

Lumber output increased more than seasonally during the week ended April 8. The week's gain of 4 per cent in production was accompanied by a decline of 10 per cent in shipments, with no significant change in the flow of new orders.

Business failures during the week ended April 6, as reported by Dun & Bradstreet, numbered 245, as compared with 260 during the preceding week and 253 a year ago.

Professor Fisher's index of wholesale commodity prices last week advanced two fractional points to 79.8, regaining the level maintained a fortnight earlier.

Reserves of member banks of the Federal Reserve system increased $209,974,000 during the week ended April 12. Estimated excess reserves rose $170,000,000, again reaching a new peak, $3,880,000,000.

GM-Cornell Price Index at 60.5

The General Motors-Cornell World Price Index of 40 basic commodities for the week ended April 8 was 60.5, compared with the previous week's figure of 60.7.

Philip E. Bliss

Philip E. Bliss, president of the Warner & Swasey Co., machine tool manufacturers in Cleveland, since 1928, died quite unexpectedly April 11. Mr. Bliss, 53 at the time of his death, succumbed to a heart ailment.

Arthur C. Swallow, Sr.

Arthur C. Swallow, Sr., 68, founder and president of the Motor Castings Co., Milwaukee, died April 11, after an illness of a year. He was born at Whitewater, Wis., and established the industry in Milwaukee in 1919.

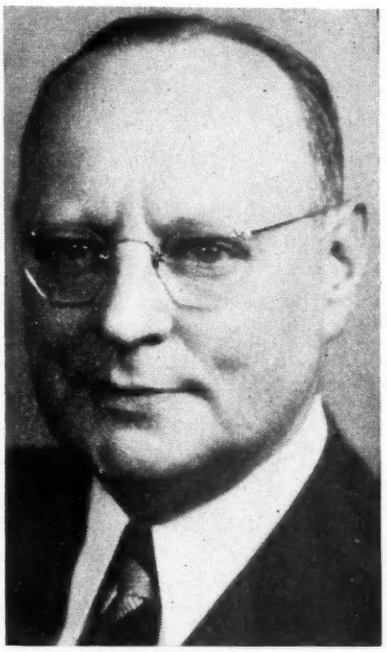
Polk Estimates March Truck Sales at 42,900

New truck sales in the United States in March are estimated by R. L. Polk & Co. at 42,900, with completed registration reports received from 21 states representing about 31 per cent of the country. This indicates that last month's truck sales were the greatest for any month since October, 1937.

For the 21 states reported, truck registrations in March totaled 13,143, an increase of 12.26 per cent over the 11,707 in March, 1938, and an increase of 30.65 per cent over the 10,059 registrations in February of this year.

Twenty-one states report a new passenger car registration in March of 65,595 for an increase of 24.98 per cent over March of last year when registrations totaled 52,481. The March, 1939, figure exceeds the 44,854 mark of February this year by 46.24 per cent.

On the basis of these returns, Polk estimates the entire nation's March new passenger car registrations at 238,500.



W. A. James

. . . who has been named head of a newly formed division of Hudson Motor Car Co. which is to be known as the Advertising and Merchandising Department.

Men

Frank W. Doyle, member of the Waukesha Motor Co. sales staff for the past three years, has been appointed to the West Coast branch where he will take up activities immediately.

R. P. Wimberly has been appointed special factory representative of the Differential Wheel Division of the Fruehauf Trailer Co.

Thomas H. Young has been appointed advertising director of the United States Rubber Co. Mr. Young succeeds **Walter Emery,** who was appointed to the newly created post of economist for the company.

James S. Latucky has been appointed sales and advertising manager of the Gilman Engineering Works, Janesville, Wis.

W. W. Peattie, president, Northern Engineering Works, has been elected chairman of the Electric Hoist Manufacturers Association.

Appointment of **O. R. Harpole** as district salesman with headquarters at St. Louis, and **Joe Sabourin, Jr.,** with headquarters at Kansas City, has been announced by USL Battery Corp., Niagara Falls, N. Y.

John B. Boyle has been named president of the Sports Motor Car Club, a newly formed organization at Montreal. Other officers are **F. W. Cole,** vice-president; **Terry McGrail,** secretary, and **Hugh C. Jockell,** treasurer.

Councillors are **P. Spencer, L. Storey, L. Barell** and **A. High.** The members of the club, owners of midget cars, have banded together for the purpose of fellowship and to promote the use of midget cars in Canada.

Ralph K. Super has been appointed to the brake engineering staff of the Timken-Detroit Axle Co., Detroit. Mr. Super was formerly associated with Linderman Devices, Inc., where he was chief engineer. Previously, he was associated with Mack Truck and General Motors in engineering and research work.

General Motors Overseas Sales

Sales of General Motors cars and trucks to dealers in the overseas markets during March totaled 37,031 units, or slightly in excess of sales in March of last year. In the first three months of 1939, sales of 101,239 units represented an increase of 4.2 per cent over sales in the first three months of 1938.

For the 12 months through March, 1939, sales totaled 358,234 units—a decrease of 4.2 per cent from the volume in the 12 months ended March 31, 1938.

Japanese Market Taking More U. S. Machinery

Japanese imports of metal working machinery from the United States during 1938 reached a record value of $23,811,408 and, with the trade continuing at the rate of $2,285,000 a month, the 1939 purchases are expected to be greater.

The Commerce Department's Machinery Division estimates that Japanese imports of metal working machinery from principal producing countries—the United States, United Kingdom, Germany and Switzerland—were valued at $35,540,986 during 1938, an increase of 104 per cent over the 1937 figure. Although the United States was the principal source of 1938 imports, back in 1934 Germany was the major supplier to the Japanese market. Imports from the United States in that year were valued at $3,025,578 and accounted for only 43.7 per cent of the total trade compared with 67 per cent in 1938.

German exports of metal working machinery to Japan in 1938 were valued at $9,437,737 compared with $3,788,825 in 1937.

Proposed Limitation Of Warning-Signal Noise

A campaign for the suppression of unnecessary noises has been under way in Great Britain for some years, and occasional references to it have appeared in these columns. One of its phases consists in efforts to reduce the noises emitted by motor vehicles. In 1934 the then Minister of Transport, Hore-Belisha, appointed a "Committee on Noise in the Operation of Mechanically Propelled Vehicles," composed of representatives of the motor-vehicle and motorcycle industries, the Ministry of Transport, and the National Physical Laboratory. Dr. G. W. C. Kaye of the Physics Department of the National Physical Laboratory was appointed chairman. A comprehensive paper by Doctor Kaye and R. S. Dadson, entitled Noise Measurement and Analysis in Relation to Motor Vehicles, which appears in the April issue of the *Journal of the Institution of Automobile Engineers*, describes the basic experimental work carried out by the National Physical Laboratory on behalf of the committee and draws extensively on four published reports of the committee, three dealing with vehicle noise and the fourth with the noise of motor horns and other warning signals.

In the last-mentioned report a sort of model law regulating the noise of motor horns was presented. It provides that when the warning device is mounted in the open air, at a height of 2 ft. 6 in. above the ground, under normal conditions of operation and adjustment, the loudness measured at a distance of 20 ft. both in front and to each side shall not, in each of these positions, exceed 100 phons. Conditions under which the measurement is to be made are specified in detail. The loudness limit shall not be applicable to fire engines, ambulances or other vehicles used for special purposes. It is also suggested that the Minister reserve the right to amend the above loudness limit in the future in the light of further developments.

G. H. Pratt

. . . new general sales manager of Hudson Motor Car Co. Mr. Pratt will be in complete charge of domestic and foreign sales and service operations.

Nash's March Sales Top '38 by 83.1%

Retail sales of new Nash cars during the final 10 days of March increased 93.9 per cent over the comparable period, and were the highest for any 10-day period since July, 1937. Following a steady upward trend, sales during the period totaled 2867 units, as compared with 1479 units in the last 10 days of March, 1938.

Nash's total sales in March were 6255 units, a gain of 83.1 per cent over the same month last year, when 3416 units were sold. The gain over February, 1939, was 78.5 per cent.

Sales during the first quarter totaled 13,366 units, an increase of 66.7 per cent over 8019 new Nash cars sold during the first quarter of 1938.

Books

LA TECHNIQUE DE L'ECLAIRAGE DES AUTOMOBILES, *by A. Monnier and M. Mouton. With a Preface by A. Blondel. Published by Dunod, 92 rue Bonaparte, Paris.*

Books dealing with automobile lighting only are comparatively rare. The two authors of the work under review are said to not only have the necessary theoretical knowledge but also a long practical experience in the branch of industry with which their work deals.

After a discussion of the French regulations regarding automobile lighting the authors deal with the theory, the engineering principles, and the production of automobile headlamps, and with methods of inspecting reflectors, lenses and bulbs. They discuss the optimum distribution of light in the beam, and methods of obtaining this distribution; they also study the propagation of luminous rays through foggy atmospheres and the physiological effects produced by these rays. A comprehensive bibliography on automobile lighting is a feature of the work. The price of the cloth-bound volume of 224 pages (79 illustrations) is 88 francs plus 12 per cent for foreign postage, or about $2.60.

AUTO-BUCHERSCHAU 1938. *Published for the Reichsverband der Automobilindustrie E. V. by Verlag Klasing & Co., G.M.B.H., Berlin W-35, Germany.*

This annual, which appears this year for the sixth time, lists all publications in the German language that relate to the manufacture, sale and use of motor vehicles and appeared during the calendar year 1938. Books and publications dealing with the related subjects of motor fuels, motor roads, traffic problems, maps, as well as works of fiction with an automobile background and trade or industrial publications also are included. This year's edition lists 872 titles.

Trade Association Executives To Meet in Washington May 1

Thurman Arnold Will Discuss Relation of Anti-Trust Laws to Present Production and Distribution Systems

Assistant Attorney General Thurman W. Arnold will discuss the relation of the anti-trust laws to existing methods of production and distribution and the problems they impose on Government and business in application of Federal statutes before the American Trade Association Executives in Washington, May 1.

With a full day's business program beginning on that date, the trade group will hold its mid-year dinner on the night of May 2 at which Secretary of Commerce Harry L. Hopkins will present the ATAE award to the association which has made the most notable contribution to industrial management during the year. The meeting is expected to have an attendance of upwards of 200 trade association executives.

The business program follows:

"Cooperation Between ATAE and the U. S. Chamber of Commerce," Herman Fakler of Washington, vice-president, Millers' National Federation and president of ATAE.

"Cooperation with the National Industrial Council," Roscoe C. Edlund, New York City, manager, Association of American Soap and Glycerine Producers.

"Simplification of Government Reporting Requirements," Dr. Stuart A. Rice, chairman, Central Statistical Board, Washington, D. C.

"Trends of the Day," Ray Tucker, Washington columnist, McClure Newspaper Syndicate.

"Industrial Mobilization," Col. Harry K. Rutherford, Ordnance Department; director, Planning Branch, Office of the Assistant Secretary of War.

"The Importance of the Walsh-Healey Act to American Industry and Its Relation to the Trade Association," L. Metcalfe Walling, Administrator of the Division of Public Contracts, Department of Labor.

Linn Mfg. Co. to Make Tractors in Buffalo

The Linn Mfg. Corp., producer of heavy duty tractors, will begin operations in Buffalo, N. Y., in about two months. The company, which will move its manufacturing facilities from its present location in Morris, N. Y., has taken over a plant formerly occupied by the Fowler & Union Horse Nail Co. The property consists of 7½ acres and a modern one-story factory with 77,000 sq. ft. of floor space.

In addition to the 40 carloads of equipment and machinery that it will move to Buffalo from Morris, the Linn Co. will purchase about $100,000 worth of new machinery and equipment.

The company recently has added to its line of heavy tractors a tractor-truck which may be used for highway or cross-country operation. The president of the concern is Franklin R. Van Rensselaer.

Publications

The AP Parts Corp., Toledo, Ohio, has issued a new booklet giving a semi-technical discussion of the inner construction of various types of AP **mufflers,** and explaining special features of the line.*

Fostoria Pressed Steel Corp., Fostoria, Ohio, has issued a booklet describing its line of **fluorescent canopies,** 25 different models ranging from a single 15-watt model to a two-tube 80-watt model.*

A calibrated "Abraser" wear testing outfit for the **grading of applied surface finishes** is described in bulletin No. 3901 issued by the Taber Instrument Co., North Tonawanda, N. Y.*

The Miller Co., Meriden, Conn., has brought out a catalog folder which announces new three-light and 48-in. **fluorescent daylight reflector units** for industrial application.*

A pictorial resumé of the complete line of latest type **presses and shears** manufactured by Niagara Machine & Tool Works, Buffalo, N. Y., is contained in a broadside published by this company.*

A pamphlet issued by the Ideal Commutator Dresser Co., Sycamore, Ill., describes the company's new series of "Select-O-Speed" **transmissions** with hand wheel control.*

"Problems Solved by Broaching," bulletin No. 12701, and **"For Accurate Universal (Thread) Grinding,"** bulletin No. 12591, are two new publications offered by Ex-Cell-O Corp., Detroit.*

Technical bulletin covering the properties and uses of **"PVA" polyvinyl alcohol** has been issued by The R. & H. Chemicals Department, E. I. du Pont de Nemours & Co. Applications of the product for greaseproof coatings, textile sizing, adhesives, molded articles and protective coatings are described. Chemical data dealing with viscosity, blending characteristics, solubility, and film strength are included.

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Tire Production Steady At 5,000,000 Per Month

Despite the threat of European war rubber prices have not advanced, and there is no indication of any tendency upon the part of American tire manufacturers to speed production and increase finished goods inventories. Tire production is holding at a rate of approximately 5,000,000 tire units per month. Inventories are lower than a year ago, and deliveries are keeping abreast of output. The proposal of a British-United States swap of cotton for rubber, as a war emergency, has caused crude rubber prices to ease off slightly, with the current market now under the 16-cent level.

Crude consumption increased 18.4 per cent in March over February, amounting to 50,165 tons. This was 64.5 per cent more than in March, 1938. Imports in March were 38,989 tons—a gain of 6.8 per cent over February and of 8.4 per cent over March, 1938. At the end of March total domestic rubber stocks were 219,843 tons, against 299,172 a year ago. Crude rubber afloat totaled 55,981 tons. Reclaimed consumption in March was 15,322 tons against production of 14,528 tons.

Preliminary first quarter figures indicate total shipments exceeding 12,000,000 tires including about 5,000,000 to car manufacturers and about 7,000,000 to the replacement market. Original shipments were more than double those of a year ago and replacement shipments were a third higher.

Tire Safety Campaigns Planned for June 10-23

Using the successful 1938 Denver tire safety campaign as the example and pattern, the Rubber Manufacturers Association has bulletined all tire manufacturers recommending their cooperation in staging local cooperative tire safety campaigns, June 10-23, in cities from coast to coast. This type of program will replace the association's campaign of last year when only national advertising was used, with no local activities in various cities.

Under the plan announced by the association, manufacturers will be assigned cities in which to organize tire marketers. Each local campaign will embrace independent tire dealers, chain stores, tire manufacturers' own stores, oil company outlets, etc., and will be financed locally. Samples of the window displays, station banners, lapel buttons, billboards, newspaper advertisements, etc., used in the Denver campaign last autumn, will be provided each local committee.

The Rubber Manufacturers Association points out that midsummer is the time of heaviest motoring and of greatest tire failure. With millions of motorists expected to travel to and from the New York and San Francisco Fairs this summer, it is estimated that through timely inspection and replacement of unsafe tires, total replacement tire sales can be materially increased.

Cities so far selected for local campaigns include the following: Atlanta, Baltimore, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Denver, Des Moines, Detroit, Hartford, Indianapolis, Jacksonville, Los Angeles, Kan-

sas City, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Oklahoma City, Omaha, Philadelphia, Pittsburgh, St. Louis, Portland, Salt Lake City, San Francisco, Seattle and Syracuse.

While the dates June 10-23 have been recommended, they are not arbitrary, with each community privileged to set its own time for its campaign.

News from Japan

(*Continued from page* 510)

balls are probably from junked automobiles. Australia is also an important Japanese supplier of automobile melting scrap, Japan being practically the only market within comfortable shipping distance.

New Manchu Auto Plan

Talk of a 100-million-yen automobile firm for Manchukuo bobbed up again in connection with a visit here by Mr. Yoshisuke Aikawa, head of the Manchuria Industrial Development Corporation.

Mr. Aikawa is said to have succeeded in breaking down the long-standing opposition in official Japanese quarters to the establishment of automotive industries on the continent and to have obtained permission to go ahead with his pet project, for which he once hoped to obtain financial assistance from the United States. In fact, several Manchuria Industrial executives are said to be still in the United States to keep American interest in the project alive.

As matters stand, the 100 million yen will have to be put up by Japanese investors, and Mr. Aikawa hopes that preparatory work will be completed on a three-year program commencing April 1. By the end of the 1941-42 fiscal year the factory and all other technical equipment are expected to be ready for production.

The annual manufacturing capacity is to range between 30,000 and 50,000 cars. Disposal of the existing Dowa Automobile Company is one of the important problems confronting the sponsors of the scheme. Dowa is financed by all Japanese automobile and major parts manufacturers, all of whom have an interest in the continuation of its assembling operations, which provide a profitable outlet for parts and accessories.

Natural Gas Favored

Leaking charcoal-gas generator installations to city buses are said to have caused several cases of fatal "CO" poisoning. Another drawback to the use of carbon monoxide gas as gasoline substitute is the high rate of cylinder corrosion and the inability of the engines to stand up during even short periods of overload. The loss in power is so substantial that a fully packed bus is unable to negotiate a 2 per cent grade.

In view of these experiences Japanese police authorities have abandoned their opposition to the installation of steel bottles containing compressed coal, producer or natural gas, all of which give better power and are less poisonous than charcoal gas.

As Japanese manufacturers are unable to produce containers in which the gas can be safely compressed to more than 150 atmospheres (about 2250 lb. per sq. in.), permission has been given to import such bottles from Germany. These bottles are guaranteed to resist a pressure of 200 atmospheres, or about 3000 lb. per sq. in. They are made of a light-metal alloy, which reduces the loss in payload normally attending the installations of such bottles.

Service stations will be shortly built in Tokyo and other places. For the time being they will sell natural gas exclusively, which is produced in large quantities in Formosa and Japan proper. So far only small quantities of the gas have been harnessed.

Pneumatic Tire Protects Against Electrical Shock

According to a French contemporary, the Dunlop Tire Co. has developed a new pneumatic tire which is electrically conducting and which, therefore, grounds the vehicle, thereby protecting passengers against possible shock when entering and alighting. This is said to be of particular importance in the case of accumulator and trolley buses, where, if any of the power circuits should be grounded, a severe shock might be experienced. The new tire is known (in France) as the "Pneumatique Dunlop Ecta" and is said to be built of a rubber compound having a specific electric resistance of less than 50 ohms per cu. cm., whereas the resistance of ordinary rubber compounds used in tires is more than 100 million ohms.

Calendar

Conventions and Meetings

Chamber of Commerce of the United States, Annual Meeting, Washington, D. C. .....May 2-4

American Roadbuilders Association, Annual Meeting, San Francisco, May 7-10

The National Battery Manufacturers Association, Spring Convention, The Greenbrier Hotel, White Sulphur Springs, West Virginia May 11-12

American Foundrymen's Association, Forty-third Annual Convention, Cincinnati .....May 15-18

SAE World Automotive Engineering Congress .....May 22-June 8

National Metal Trades Association, Annual Meeting, Chicago....May 24-25

American Iron & Steel Institute, Annual Meeting, New York City..May 25

American Society for Testing Materials, Annual Meeting, Atlantic City .....June 26-30

Automotive Engine Rebuilders Association, Seventeenth Annual Convention, Baltimore, Md. .....July 5-7

National Petroleum Association, Annual Meeting, Atlantic City, Sept. 14-15

American Welding Society, Annual Meeting, Chicago .....Oct. 22-27

American Trucking Association, Annual Meeting, Chicago .....Oct. 23-24

American Petroleum Institute, Annual Meeting, Chicago .....Nov. 13-17

National Independent Traffic League, Annual Meeting, Chicago....Nov. 23-24

Shows at Home and Abroad

Great Britain, London, Automobile Show .....Oct. 12-21

Italy, Milan, Automobile Salon, Oct. 25 to Nov. 11

International Automobile, Motorcycle and Motor Boat Show, Budapest, Oct. 27 to Nov. 6

Great Britain, London, Commercial Automobile Transportation Show, Nov. 2-11

Great Britain, Glasgow, Scotch Automobile Show .....Nov. 10-18

Chevrolet Sales 24% Ahead of Last April

Chevrolet dealers' retail sales of new cars and trucks reached 21,743 units in the first 10 days of April, 24 per cent above the total for the same period last year, it was announced here today.

This brings Chevrolet's year-to-date sales total to 213,427 units, a gain of 33.6 per cent over the 159,697 sold through April 10, 1938.

Used car sales in the same period totaled 41,482 units, a gain of 4856 over the sales one month ago, making an aggregate new and used car total of 63,225 for the period.

Hupp Makes First Shipment Of Its New Skylark Models

First shipments of the new Hupp Skylark models to distributors and dealers were made this week.

Production will be rapidly stepped up, according to S. L. Davis, president of the Hupmobile Corp., and all models will be available by the middle of May. Rearranging of production lines and the shipping in of materials have been underway for some time.

40 Years Ago

EDITOR, *Horseless Age:*

I note the invitation in your March number to users of motor carriages to give their road experience . . . It is quite amusing when you travel on toll roads, for toll gate keepers, as a rule, have not seen motor carriages, and are at a loss what to charge. In one case the gate keeper looked at the wheels, and as they are similar to bicycle wheels, she decided the proper thing to do was to charge bicycle rates; one gate keeper on the Lancaster pike was so interested in the carriage that she forgot to collect the toll, and did not discover her mistake until I was some distance away, when she excitedly shouted to me to hold up.

From the *Horseless Age*, April, 1899.

Rear-Engined, Frameless

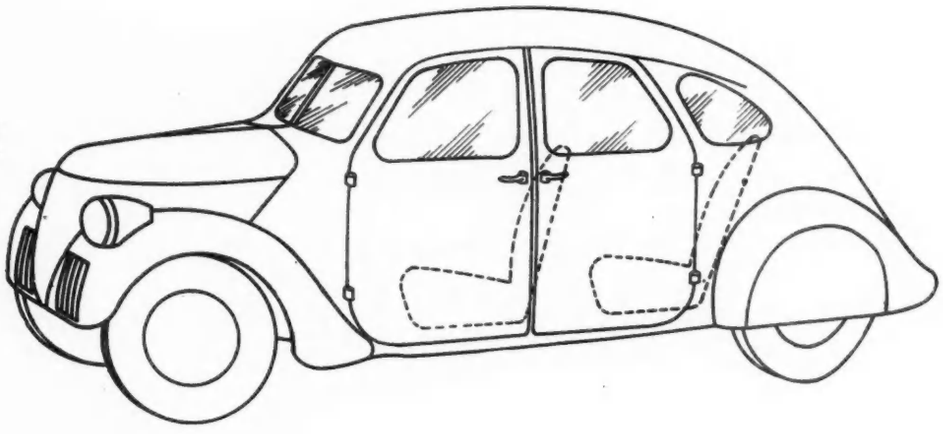


Fig. 1—Perspective view of G. M.'s unit-built rear-engined development

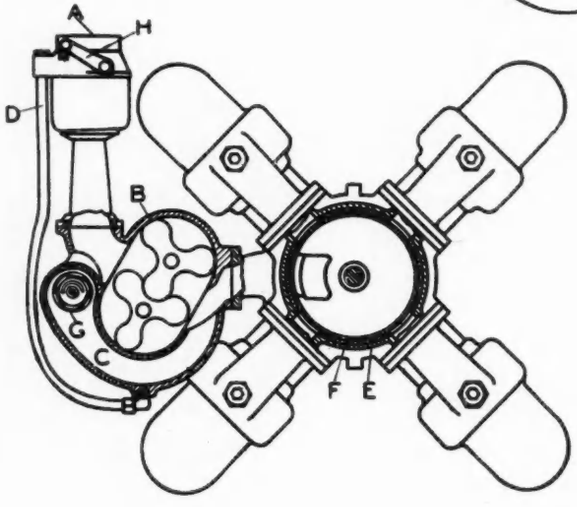


Fig. 2—Side view of radial two-stroke engine, showing carburetor, scavenging blower, and distributing and changeover valve

A, carburetor; B, blower; C, bypass to blower; D, fuel-return pipe from blower bypass to carburetor; E, rotary valve; F, change-over valve; G, valve in bypass to blower; H, fuel-control valve of carburetor. F, G, and H are connected to the accelerator pedal.

By P. M. HELDT

A SERIES of eight patents recently issued to E. O. Schjolin of Pontiac, Mich., and assigned by him to General Motors Corp., cover various details of a rear-engined, frameless (or unit-type) passenger car. The patented features include the induction system, the cooling system, the vibration damper, and the mounting of the engine on the body; a conical-type friction clutch and a method of controlling same by hydraulic means; a gear-shift mechanism, and a special type of seat. The writer understands that General Motors not only has worked out the designs for this car on paper and secured patent protection on its various novel features, but has actually built and tested the car. As most of the applications date back to the early part of 1936, it is not unlikely that the development has been carried considerably farther than is disclosed by these patent specifications.

The engine is of the two-stroke radial type, with double cylinders of U form, two adjacent parallel cylinders having a common combustion chamber. As shown in Fig. 2, there are four such pairs of cylinders. The crankshaft has two crankpins that are slightly offset angularly relative to each other, to permit the pistons which control the exhaust ports to slightly lead the pistons controlling the inlet ports. With such an arrangement of crank and cylinders it is possible to obtain uniflow operation and efficient scavenging.

A two-stroke engine, of course, calls for a scavenging pump, and a Roots' blower is shown in the drawing. Within the crankcase there is a valve with a single outlet port that rotates with the crankshaft, which connects the blower to the different cylinder pairs in turn. Concentric with the rotary valve there is another valve with four outlet ports adapted to register with the inlet passages to the four pairs of cylinders. A valve-controlled by-pass is provided between the delivery side and the suction side of the blower, and an auxiliary conduit returns any unvaporized gasoline from the blower by-pass to the carburetor. The change-over valve concentric with the rotary valve, the valve in the by-pass to the blower, and the gasoline-metering valve of the carburetor are interconnected by outside linkage, all being controlled by means of the accelerator pedal.

When the accelerator pedal is in the idling position, the change-over valve (concentric with the rotary valve) shuts off the main inlet passages to the cylinders, but opens the small auxiliary inlet passages. At the same time the valve in the by-

Passenger Car

Covered in eight patents recently issued and assigned to General Motors Corp.

pass passage around the blower is opened (so that the blower will not "lock" when its outlet is closed or nearly closed), and the carburetor fuel-metering valve is set to provide the proper mixture for idling. As the accelerator pedal is depressed, the blower by-pass passage is closed and the main inlet passages to the cylinders are opened gradually. If any unvaporized fuel collects in the by-pass to the blower while idling, it is drawn back into the carburetor through the tube extending from the lowest point of the by-pass to the carburetor, by the difference in the gaseous pressures in the blower by-pass and the carburetor air tube respectively.

The principal object in the development of this induction system seems to have been to improve the idling characteristics, which in the conventional two-stroke engine usually leave something to be desired.

The cooling system covered by one of the patents includes three small radiators, one located in the rear, directly over the transmission housing, and two at the front, outside the closed front luggage compartment and directly beneath the headlamps. The rear-mounted radiator, which is intended mainly to provide the necessary cooling capacity while the car is at a standstill and the engine is idling, is of the horizontal flow type, with a tank on each side. There is a louvered air inlet in the side of the body, and an air duct with an engine-driven fan in it extends from this inlet to the radiator housing.

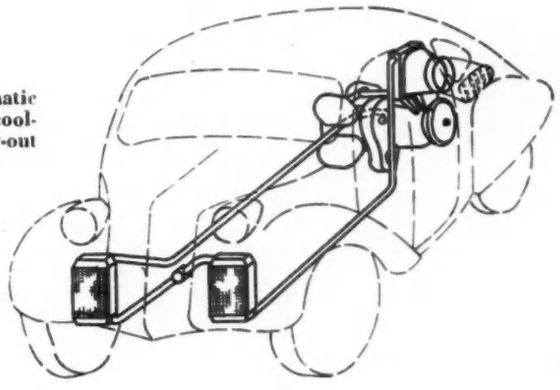


Fig. 4 — Schematic view of the cooling system lay-out

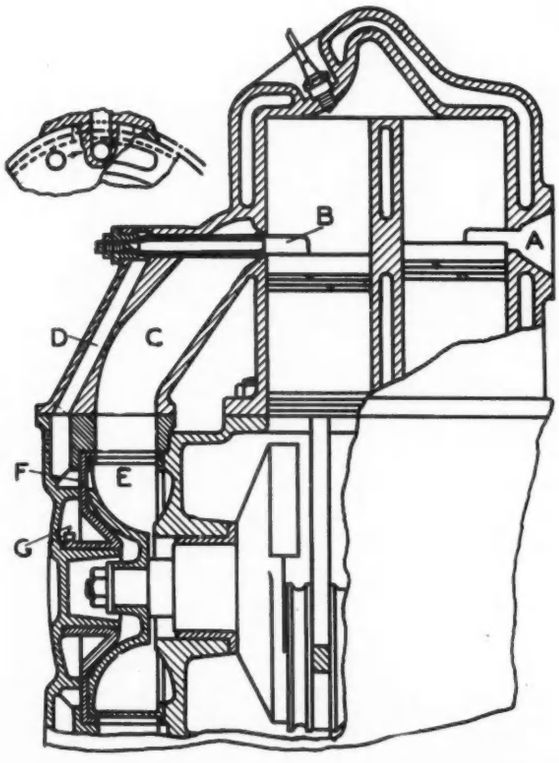


Fig. 3 — Section through engine cylinders and concentric valves in the induction system

A, exhaust port; B, inlet port; C, main passage to inlet port; D, auxiliary passage to inlet port for idling; E, rotary valve; F, change-over valve; G, toothed sector with which meshes a pinion for the control of the change-over valve.

By mounting two small radiators under the headlamps, advantage is taken of the draft created by the motion of the vehicle, and the need for fans is eliminated; the luggage compartment can be closed and, therefore, kept clean. As the hot water from the engine is carried forward to these radiators, it is an easy matter to install a car heater in front of the driver's seat. Rear-mounted radiators in general are not as satisfactory as front-mounted ones, because they do not benefit by the draft created by the motion of

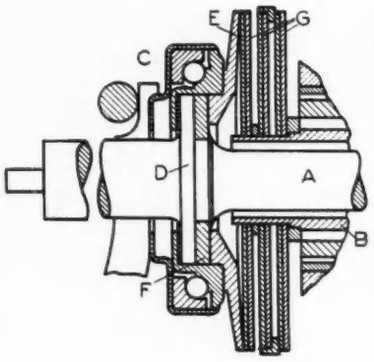
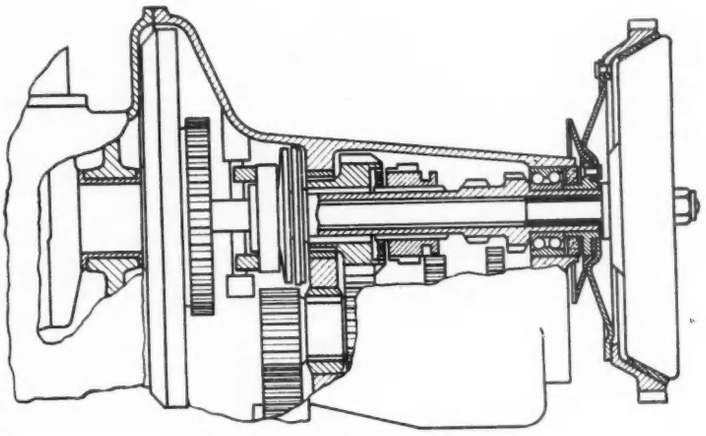


Fig. 5—Section of transmission and friction clutch, with detail of the vibration damper

A, clutch shaft; B, hollow primary shaft of transmission; C, clutch throw-out bearing; D, collar on clutch shaft serving as one member of friction damper; E, pressure plate; F, floating washer; G, Belleville washers serving as clutch springs.



the car, and also because air taken in through louvers at the rear of the body generally contains more dirt in suspension and, therefore, deposits more dirt in the engine compartment. By using only a small radiator at the rear, these objections are minimized. Moreover, the fan needed to obtain the proper cooling effect with the engine idling can be driven by simple means. Fig. 4 shows the way in which the various elements of the cooling system are connected. The front radiators may be provided with automatic shutters.

In the vehicle referred to, the engine and transmission are mounted as a unit between the rear wheels and have the final drive located between them. A conical friction clutch is provided, and is located outside the transmission housing, close to one side of the body. This necessitates making the primary shaft of the transmission hollow and passing through it a shaft which connects the engine to the clutch at the far end thereof. The central shaft necessarily has to be kept small in diameter, as otherwise the pinions on the primary shaft and the center distance between transmission shafts would become too large, and it was found that with this arrangement there was considerable torsional vibration. This is overcome by interposing a torsional vibration damper of the friction-disc type between the forward end of the hollow transmission shaft and the clutch shaft. The friction damper is combined with the clutch spring, which latter consists of a number of Belleville washers. To disengage the clutch, the central shaft is shifted axially with relation to the hollow shaft, by means of a conventional throwout collar, throw-out bearing, and yoke. From Fig. 5 it can be seen that the car has no direct drive; the power is always transmitted from the primary to the secondary shaft of the transmission, and from the inner end of the latter through spur gears to the differential.

The powerplant is detachably connected to the vehicle for support on resiliently mounted road wheels. This makes is easy to remove the whole unit when major repairs are required. A transverse tube forms a backbone for the assembly, and from the ends of this tube extend flexibly supported crank arms on which the spindles for the road wheels are carried. The transverse tube supports the powerplant, from which latter universally jointed shafts extend to the drive wheels. Provisions are made for mounting the body frame at points on the tube adjacent to the wheel mountings. In addition to being supported on the transverse tube, the powerplant is braced to the body structure by a series of diagonal struts. An important feature of the mounting is the use—in both the main support and the supplemental bracing—of rubber connections designed to insulate and reduce the transmission of engine vibration to the body. Fig. 6 shows the general arrangement of the mounting.

One patent covers the friction clutch, which is shown in partial sec-

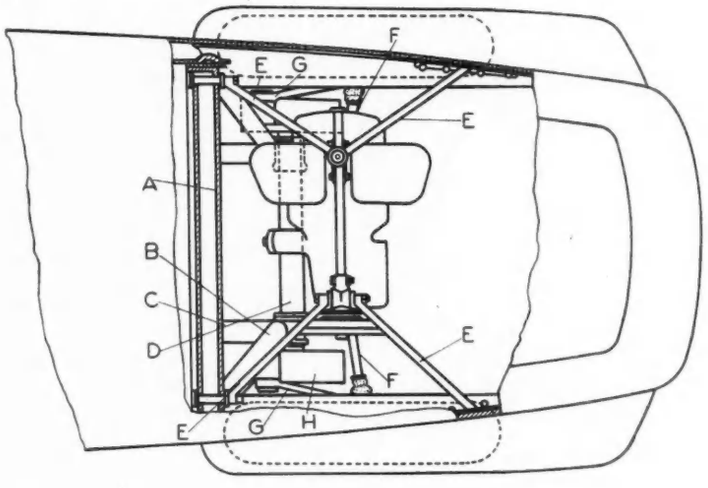


Fig. 6—Mounting of powerplant on tubular cross member and bracing to body walls

A, rib pressed in partition or cross wall of body; B, tubular member extending inward and downward to cross tube D; C, horizontal brace for cross tube D; E,E,E,E, braces extending from top of powerplant to body side walls; F,F, wheel-driving shafts; G and H, members of (Dubonnet-type) suspension. Cross tube D is clamped to the semi-cylindrical ends of the brackets formed by members B and C, and the entire rear assembly, including the wheels, can be removed after taking out a few bolts.

tion in Fig. 5. It is a cone clutch of familiar type, and the improvements relate to features that tend to reduce the cost of manufacture. The male cone (the driving member) consists of two light, almost identical stampings, each comprising a web and a cone, the two being welded together and having the edge at the open side of the cone turned inward for increased stiffness. The female cone, or driven member, consists of a web made up of two light pressings, welded together; a hub and a conical steel ring, both secured to the web.

The transmission is similar to current types in that it has two sliding members, one for low speed and reverse, the other for intermediate and high speeds, but these sliding members are carried on the primary and secondary shafts, respectively. The

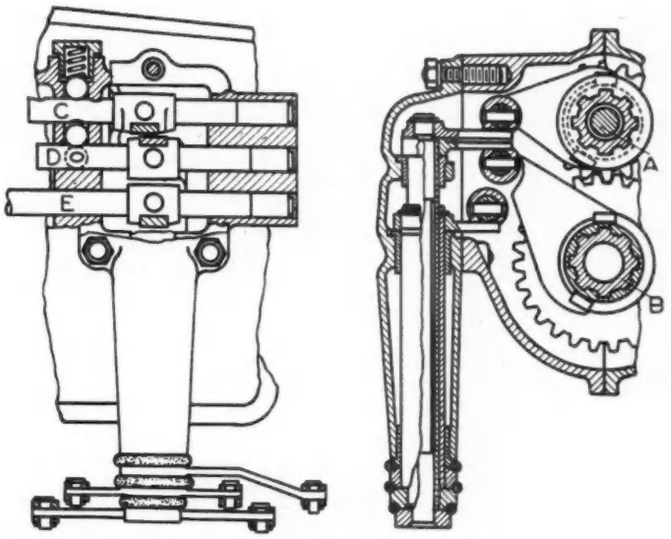


Fig. 7—Shifting mechanism on transmission
A, transmission primary shaft; B, transmission secondary shaft; C, shifter bar for high and intermediate speeds; D, shifter bar for low speed and reverse; E, clutch-control slider.

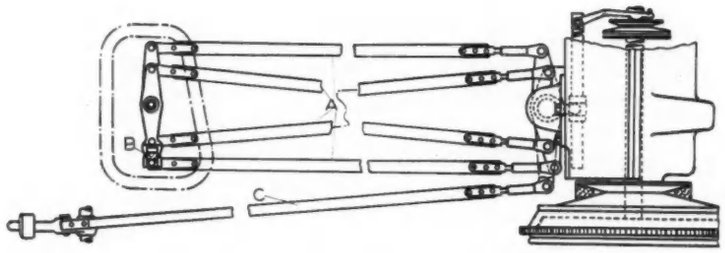


Fig. 8—Connections from shifter mechanism on transmission to control mechanism in driver's compartment
A, steel ribbons connecting double-armed levers on transmission housing to corresponding levers on floor of driver's compartment; B, lower end of gear-shift lever; C, steel ribbon connecting clutch throwout lever with clutch pedal.

all of the gears are in the neutral position. The lower end of a ball-mounted shift lever is adapted to engage into the slot on one or the other of these double-armed levers, and when thus engaged the particular lever can be turned around its axis to move the sliding member in the transmission into one or the other of its positions of engagement.

(*Turn to page* 538, *please*)

sliding members are operated through shifter arms mounted on the ends of concentric tubes that extend down through a column-shaped housing bolted against the side of the transmission housing. A tube to which the clutch throw-out fork is secured also is mounted concentric with those for the gear-shifter arms. At its lower end each of the concentric tubes has a lever secured to it, the ends of which are connected by metal ribbons with shifting means and with the clutch pedal at the forward end of the chassis. The ribbons pass through grooves in the floor board, these grooves being covered by metal strips to maintain a level and rigid floor. The shifting means at the front comprise two double-armed levers, each provided with a square slot at one end, the two slots being in line with each other when

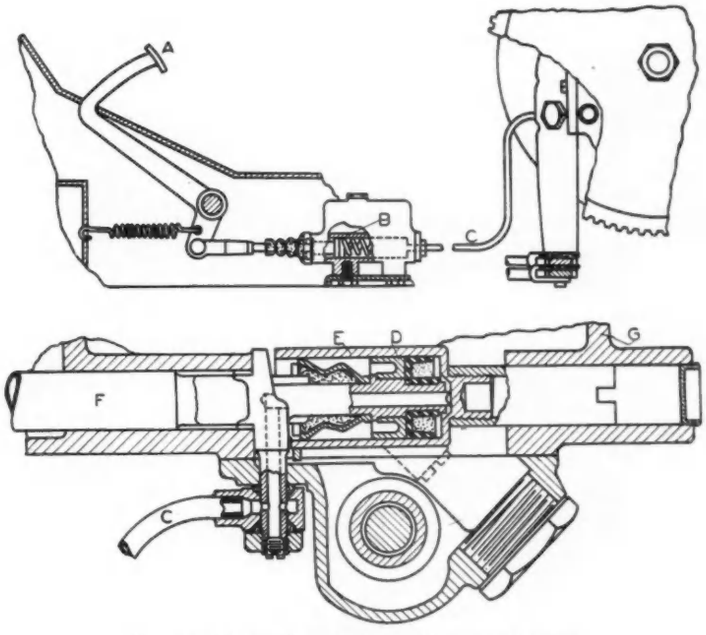


Fig. 9—Hydraulic clutch-shifting mechanism
A, clutch pedal; B, master cylinder; C, tube carrying fluid under pressure to clutch-control cylinder; D, stationary piston of clutch-control cylinder E; F, shifter rail connected to cylinder E; G, transmission housing.

New York University

By H. E. Blank, Jr.

PRACTICAL research on automotive and aircraft problems is constantly in progress in the engineering laboratories of New York University. Because much of the work has specific industrial significance and is done in cooperation with manufacturers or inventors, it has received relatively little public notice as compared with the research activities of several other prominent technical schools in the East. In fact, it is impossible to convey accurately the quantity and quality of the services of this character being rendered by N. Y. U. beyond the school's primary function of providing young men with an opportunity for a "well-rounded education in liberal science and engineering."

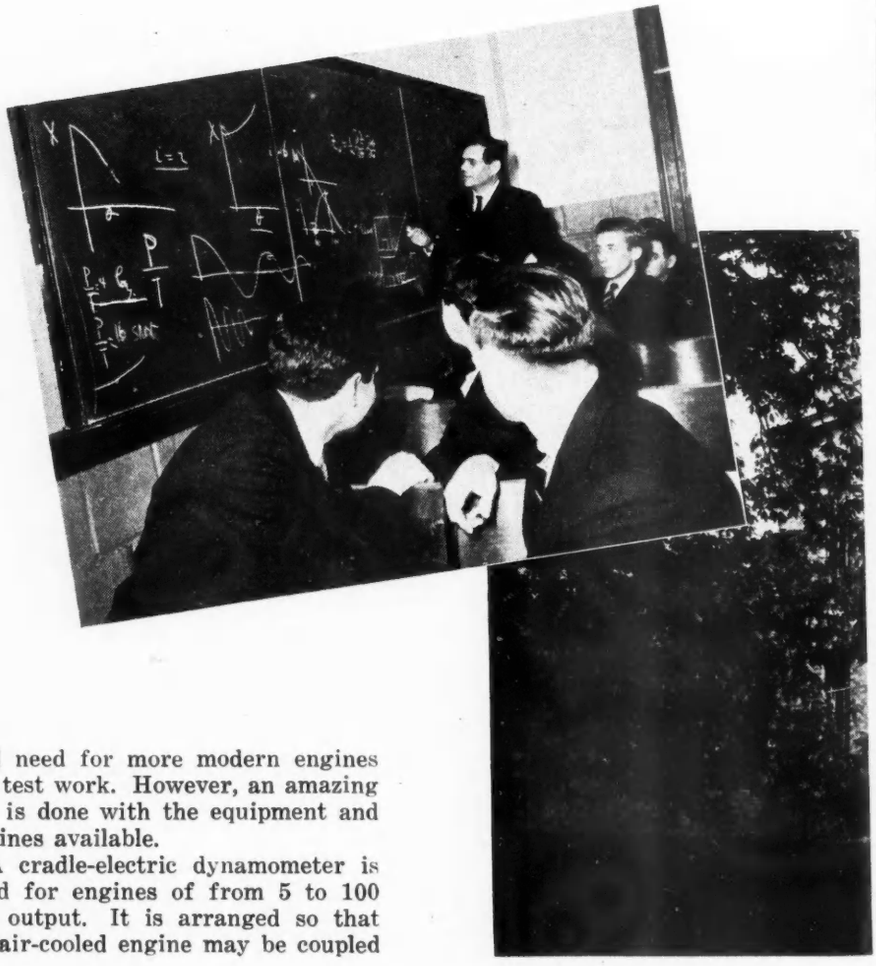
Many automotive engineers will recall the extensive survey of automobile brakes made about two years ago by the University's mechanical engineering department in conjunction with the W.P.A. More than 3000 brakes were tested in this huge study made under the supervision of E. H. Hamilton, associate professor of automotive engineering. The voluminous data obtained revealed that many cars operated on U. S. highways were equipped with brakes wholly inadequate to stop them within limits prescribed by the various state laws. Further, it was found that certain makes of cars had an appreciable unbalance in braking either between the left and right side or between front and rear brakes. The Society of Automotive Engineers has a complete report of this study on file in its headquarters building in New York City.

The effect of upper cylinder lubricating oils on an internal combustion engine was the subject of considerable experimentation. Analysis of the data showed that most upper cylinder lubricating oils on the market reduced frictional losses. It was concluded that this result was brought about by thinning of the regular lubricating oil and the ability of the upper cylinder oil to reach certain tight fitting parts which otherwise would probably run dry. Another study completed recently for a well-known American corporation was concerned with the use of gasoline treated with colloidal graphite. Unfortunately the details of this investigation have not been released for publication. The effect of relative humidity on the efficiency and power output of an internal combustion engine is the subject of an investigation now being conducted by a graduate student.

Test equipment for automotive research is housed in the Sage Laboratory building. In this laboratory, as in most university laboratories which the writer has had the opportunity to inspect, there is real need for more modern engines for test work. However, an amazing job is done with the equipment and engines available.

A cradle-electric dynamometer is used for engines of from 5 to 100 hp. output. It is arranged so that an air-cooled engine may be coupled to one end, a water-cooled engine to the other. A fan driven by a variable-speed electric motor supplies cooling air through a sheet metal duct system. Special cowlings have been built for the various engines—one of the latest acquisitions being a four-cylinder Continental model A 40.

A Brush one-cylinder automobile engine built in the early 1900's is set up for indicator tests. Professor Hamilton proudly asserts that this museum piece "does everything anybody would want it to do." Another relic still in use is a converted Ace



Laboratories

Are a Lively Scene of Practical Research on Automotive and Aircraft Problems Posed by Manufacturers and Inventors

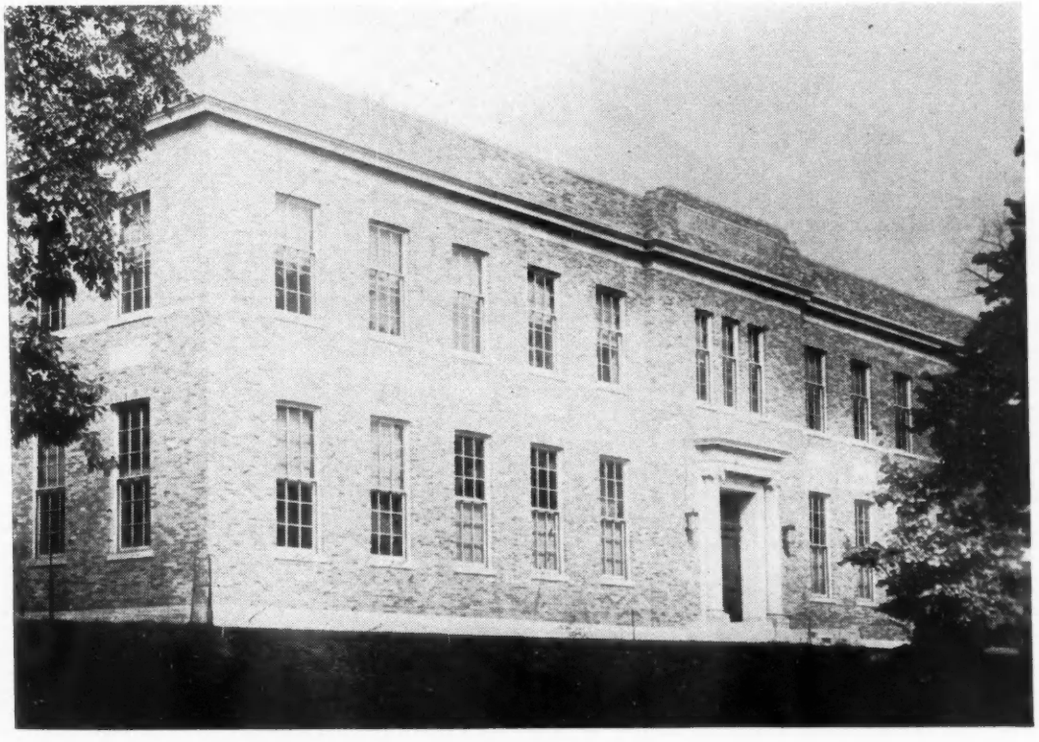
motorcycle engine set up on a torque stand. This engine had seen service on a Heath Parasol airplane. An old Ethyl Gasoline Corp. C.F.R. engine, No. 28 model, is still in use. There is, too, a wartime model OXX6 Curtis-Wright aircraft engine connected to a hydraulic dynamometer. When the OXX6 was installed great difficulty was experienced in operating it, chiefly in keeping universal joints installed. A flywheel was the answer to the problem.

More modern equipment includes a Waukesha standard C.F.R. engine which may be coupled to an electric dynamometer for power determinations or attached to a synchronous motor for standard fuel tests. Complete equipment is available for operating the Waukesha as a compression-ignition engine so that cetane determinations of fuel oil can be made. A fuels and lubricants laboratory equipped with the usual A.S.T.M. standard apparatus for testing is located on the top floor of the Sage building.

Mainly used for student instruction are a Ford V-8 engine connected to an electric dynamometer in a conventional arrangement and a four-cylinder Buda Diesel coupled to another dynamometer. A four-cylinder Hercules Diesel was installed recently. A calibrated Roots blower is used to measure the quantity of air consumed by engines on the test floor. The blower is equipped with a counter which gives direct readings in cubic feet. Intelligent design of the blower system makes it easy to pipe air to any engine in the laboratory. Also available at each test stand are 110-volt and 6-volt plug-in connectors.

Excellent facilities are available at N. Y. U. for comprehensive aeronautical research. The late Daniel Guggenheim's generous gift of $500,000 made possible the establishment in 1925 of the now world-famous Guggenheim School of Aeronautics, which is in charge of Dr. Alexander Klemin. An extension to the original two-story brick structure was built in 1932.

This branch of the engineering school is especially active in research work. Current investigations are concerned with the porpoising of seaplanes, vibration,

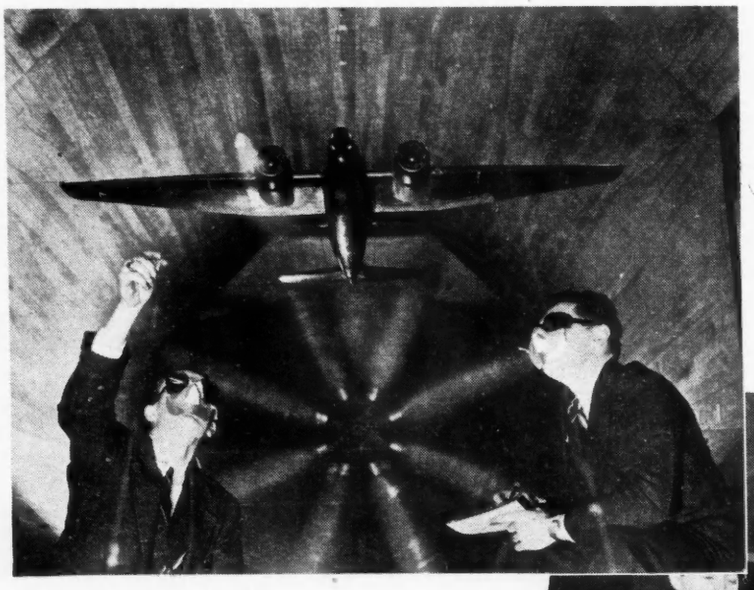


Dr. Alexander Klemin, director of the Guggenheim School of Aeronautics at N. Y. U., with some of the students in a classroom

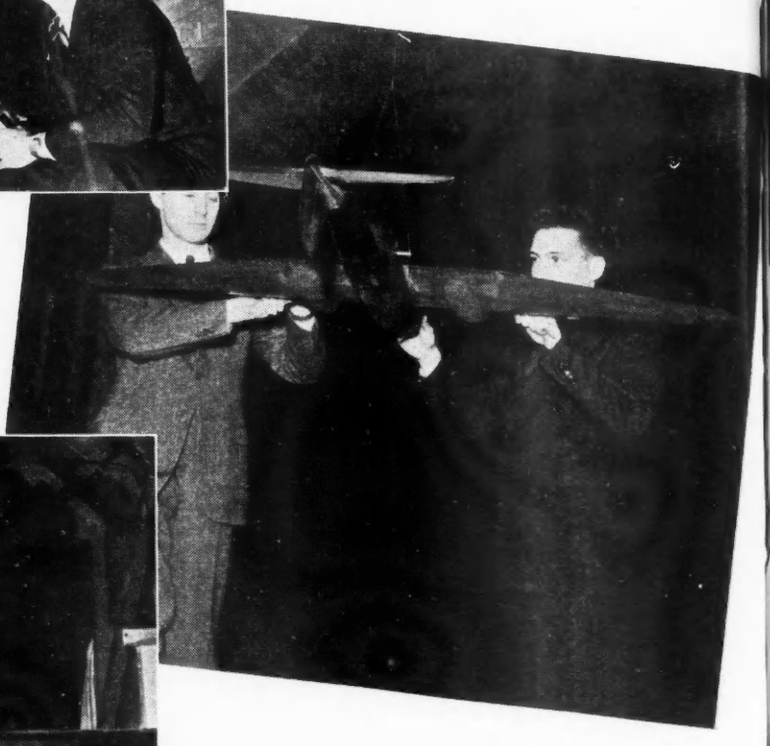
Exterior of the Guggenheim School of Aeronautics

balancing control surfaces, the Fowler Flap, temperature corrections for altimeters, beryllium, autogiro dynamics, and the aircraft Diesel.

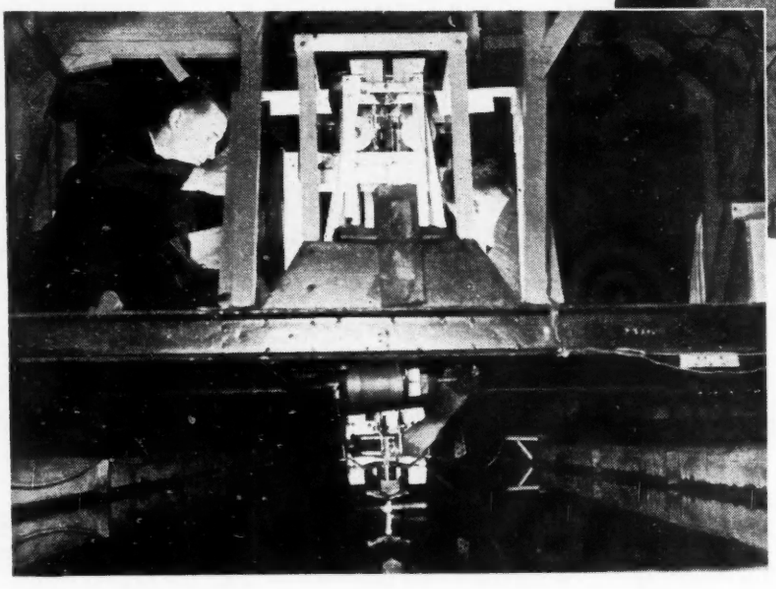
Vibration of aircraft is introducing problems which become more and more serious as speeds of airplanes increase. In addition to considerable theoretical studies of vibration, a variety of apparatus has been developed at the University for



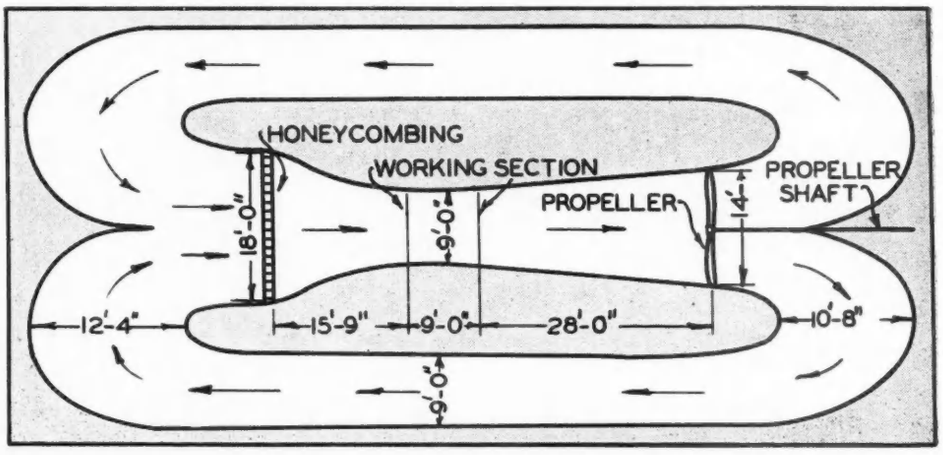
Students, begoggled and masked, making airflow tests with chemical smoke on a model airplane



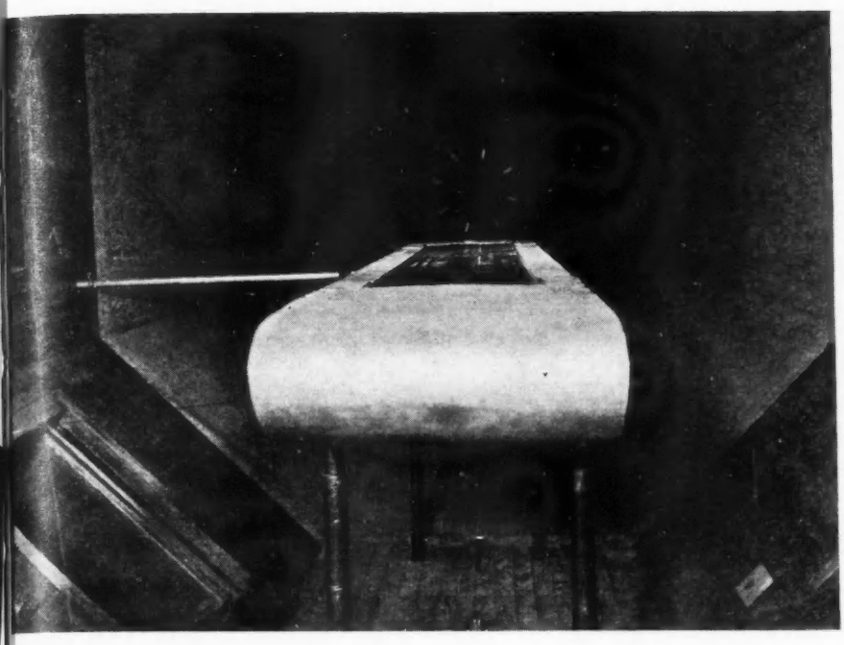
(Above) Another view of the wind-tunnel taken from the opposite direction



Setting the hull of a seaplane model in the school's towing tank preparatory to making speed tests



Plan of the wind tunnel with Witoszinski return bends. The arrows indicate the air flow. The total inside length is 93 ft. 3 in. while the width is 46 ft.



Moving belt ground board set up in nine-foot tunnel

return type, having curved passages and a honeycomb at the entrance end. A diagrammatic sketch of the tunnel appears on page 528. Aerodynamic forces are measured on a six component wire balance system in which each balance operates automatically. This permits simultaneous measurement of all six components, three forces and three moments.

Of the auxiliary equipment used in conjunction with the wind tunnel, an especially interesting device is the moving belt ground board. It consists essentially of a seamless rubber belt, 15 in. wide and 8 ft. long, which can be run at linear speeds up to 70 m.p.h. Streamlined automobiles as well as trains are studied with the aid of this device.

Wind tunnel balance platform showing students recording data of a wind tunnel test

reducing vibration, measuring vibration periods, and damping under conditions simulating flight and in actual flight. It is hoped that the results of this work will point the way to the design of inexpensive equipment for detecting and analyzing vibrations. Professor Klemin points out that similar methods should be of interest to the automotive industry.

Beryllium, with a specific weight approximately the same as that of aluminum and a strength of 100,000 lb. per sq. in., is to be studied to find out if its use in aircraft would sufficiently reduce weight with subsequent increase in payload to offset the relatively high cost of the metal.

Another project soon to be undertaken by a graduate student is the ambitious task of setting forth the ideal specifications of the aircraft Diesel with suggestions for designers of this type of powerplant. A current research project deals with the effect of varying ignition timing on the efficiency of aircraft engines.

The Guggenheim School has been unique among educational institutions in doing pioneer work in the field of rotary aircraft. Recent advances in the autogiro and helicopter are regarded as highly significant and intensive research is to be pursued on this subject.

Facilities of the Guggenheim laboratory may be classified under 10 general headings, as follows: aerodynamics, structures, aircraft materials and accessories, engines and accessories, lighter-than-air, instrument and full flight testing, propeller fan laboratory, towing basin for hulls and floats, soundproofing laboratory, and model construction and machine shop.

One of the most heavily-used pieces of equipment is the nine-foot wind tunnel with which wind speeds as high as 115 m.p.h. can be developed. Air flow is created by an eight-bladed metal propeller driven by a 300 hp. d.c. electric motor. The tunnel is of the closed-throat double

Augmenting the laboratory equipment is a 150-ft. towing basin housed in a separate building which was completed only a short time ago. A moving platform, from which test models of floats, hulls of flying boats, marine propeller models, and allied objects are suspended, is capable of towing models through water in the basin at speeds up to 20 m.p.h. The towing basin and the nine-foot

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Characteristics of Magnetically

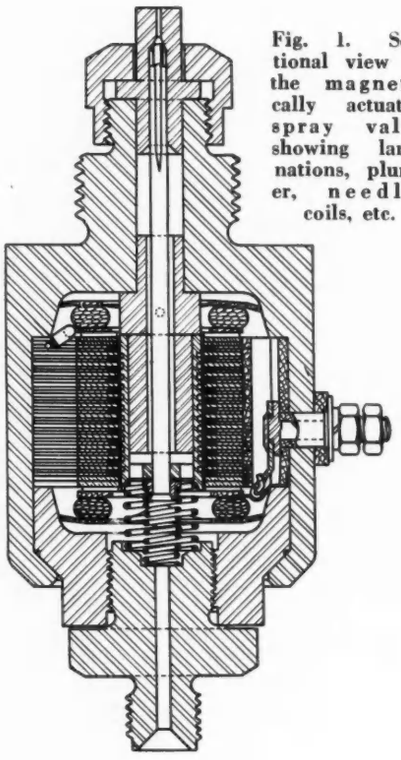


Fig. 1. Sectional view of the magnetically actuated spray valve showing laminations, plunger, needle, coils, etc.

By C. J. VOGT
and T. A. ROGERS*

THE function of any fuel injection system is to deliver a metered quantity of fuel to the engine cylinder and to distribute it in such a way that combustion may progress in the desired manner. This has been accomplished on many engines by the jerk-pump system, which, due to its simplicity, has become very popular in the field of high-speed Diesel engines. In the jerk-pump system the pressure transmitted to the fuel column by the pump supplies the energy which is required to actuate the needle in the nozzle. Hence, in such a system, satisfactory fuel metering, dispersion, and distribution in the engine cylinder depend upon the dynamics of the fuel pump, the dynamics of the fuel column between the pump and the nozzle, the dynamics of the nozzle, and the geometry of the system. Since in this method of injection the fuel column is an oscillating system, influenced by both the action of the pump and the nozzle, as well as by certain characteristics of the fuel which are not too well known, large variations in successive injections may be expected.

The Atlas Imperial Diesel Engine Co., of Oakland, Calif., has developed a system of injection for small, high-speed engines which eliminates most of the problems encountered in the jerk-pump system. This system employs the common-rail principle with a magnetically actuated nozzle.[1] Although the engines in which these nozzles are used employ spark ignition and operate with low compression ratios, the system satisfies the requirements of Diesel engines.

Experimental Equipment

The experimental equipment employed in comparing the characteristics of the magnetically-actuated nozzle with the jerk-pump system consisted of a spray chamber at atmospheric pressure, on which was mounted a stroboscope. With the aid of the stroboscope the points of

[1] "Magnetically Actuated Spray Valves Meter Fuel." P. M. Heldt. AUTOMOTIVE INDUSTRIES, March 4, 1933.

* University of California.

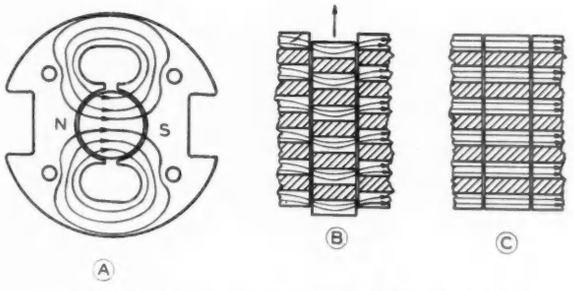


Fig. 2. Flux lines in the magnetically actuated spray valve

A. Flux lines in the plane of a lamination.
B. Flux lines through the frame and plunger laminations when needle is seated.
C. Flux lines through the frame and plunger laminations when the needle is lifted from its seat.

Actuated Fuel Injection Valve

release and cut-off, the penetration as a function of time, and the form of the spray could be observed. The stroboscope was timed by a rotating switch consisting of a spark gap, one side of which was mounted on a graduated disk which could be rotated to any desired position, while the other side was mounted on a rotating disk. The rotating disk was attached to the motor shaft, which also operated the breaker points to charge and discharge the condensers operating the magnetically-actuated valve. The same motor operated the fuel pump for the jerk-pump system. The fuel system consisted of a container mounted on a torsion balance. Fuel was drawn from the container by a transfer pump and passed through a filter. After leaving the filter, the fuel could be passed either to the jerk-pump or the high-pressure fuel pump for the common-rail system of the magnetically-actuated valve. The common-rail system consisted of a single-cylinder, high-pressure fuel pump which delivered the fuel at a pressure of 4000 lb. per sq. in. to a small chamber. The chamber was connected to the nozzle with a fuel line 6 in. long having an internal diameter of 0.06 in. The chamber was also connected to a pressure regulator by means of which the pressure could be maintained constant at any desired value between 1000 and 4000 lb. per sq. in. With the aid of a revolution counter attached to the system, the average weight of fuel injected per cycle was obtained.

The magnetically actuated valve was controlled by a bank of four condensers connected in parallel. By using various combinations of condensers, better control for test purposes could be obtained than if a variable resistance had been used in the charging circuit. The electrical characteristics of the system, with and without variable resistance, were studied with the aid of an R. C. A. 3-in. cathode-ray oscillograph equipped with a No. 908 tube having a blue screen.

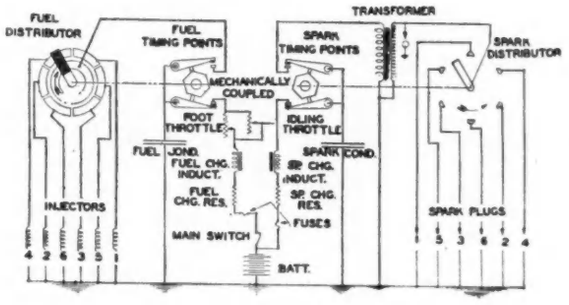


Fig. 3. Wiring diagram for a spark ignition engine equipped with magnetically actuated spray valves

Fuel Valve

The magnetic type of spray valve derives its actuating force from the magnetic attraction of a series of small electro-magnets. The construction of the valve is shown in Fig. 1. The valve consists of 12 iron laminations alternated with non-magnetic laminations. The hollow core through which the needle passes consists of a similar set of laminations. Forty turns of No. 20 copper wire constitute the magnetizing coils, which pass through the shell laminations. The coils are placed in such manner that current flowing through them will produce alternate north and south poles around the circumference of the wire, thus inducing opposite poles in the plunger laminations, as indicated in Fig. 2A. This construction is similar to the field-pole arrangement on a direct-current motor.

The laminations on the plunger are displaced toward the valve tip with respect to the frame laminations when the valve is closed. When the circuit through the field coils is completed the resulting current produces a magnetic flux (Fig. 2B) which in turn develops a force tending to lift the valve from its seat. In order to lift the needle as rapidly as possible, the plunger is allowed to move freely for 0.005 in. before striking the collar on the needle. As the current in the coil increases, a critical point is reached where the magnetic pull, and the inertia of the plunger, overbalance the combined force of the spring and oil pressure, and the plunger then moves to a position in which the laminations of the plunger and frame are in the same plane (Fig. 2C). At this position the valve is open and the needle has lifted a maximum distance of 0.028 in. The plunger and frame laminations will remain in the same plane, and thus the valve remains open, until the current and the magnetic flux decrease to a value which no longer balances the combined force of the oil and spring. The closing current is less than the opening current, due to the decreased magnetic reluctance and a small hysteresis in the iron.

Among the desired operating characteristics of an injection valve are ease of control and ability to inject

an identical quantity of fuel at each successive operation. These characteristics are readily obtained by means of a simple electrical circuit.

Electrical Circuit

The complete electrical circuit, as used with the Atlas engine, for actuating the spray valve and supplying energy for ignition, is shown in Fig. 3. The condenser in the spray-valve circuit is first charged through a mechanically operated breaker and then discharged through the valve circuit coupled through a second breaker point to the fuel distributor. The amount and duration of the current are determend by the charge of the condenser, the size of the condenser, and the inductance and resistance of the valve.

For simplicity, the valve circuit may be reduced to its electrical constants and the simple electrical circuit shown in Fig. 4A. The cycle of operations consists of a charging period when the switch S is thrown to position 1, and a period of discharge, when the switch is thrown to position 2. During the charging period the condenser C receives a charge from the battery E through the throttling resistance r. If E and C are considered fixed, the magnitude of the charge depends upon the value of r and the length of time that switch S is closed in position 1. The voltage across the condenser may be expressed by the relation

$$E_c = E\left(1 - \epsilon^{-\frac{t}{rc}}\right) \qquad (1)$$

and the charge of the condenser by

$$Q = CE_c = CE\left(1 - \epsilon^{-\frac{t}{rc}}\right) \qquad (2)$$

The variation of the charge, as a function of the time the condenser is charging, is shown in Fig. 4B.

For increasing values of throttling resistance, r, $2r$, $4r$, $8r$ and a constant charging time t (constant engine speed) the condenser will have decreasing values of charge ($Q = CE$) of Q, Q_1, Q_2 and Q_3.

During the discharge period, when switch S is in position 2, the charge of the condenser will flow through the inductance and resistance of the valve circuit. If the resistance of the valve is small in comparison with its inductance, the discharge current will be oscillatory. This condition is expressed by the relation

$$i = -\frac{E_c}{L\omega}\epsilon^{-\frac{RT}{2L}}\sin\omega t \qquad (3)$$

where $\omega = \sqrt{\frac{1}{CL} - \frac{R^2}{4L^2}}$

Equation (3) represents a damped sine wave with an amplitude proportional to the charge of the condenser. This is graphically represented in Fig. 4C. The time interval during which the valve is open is a function of the opening current i_A, the closing current i_B, the charge of the condenser, and the frequency of oscillation of the electric charge in the circuit. With a full charge in the condenser, the valve is open for the period $\triangle t_1$; with a reduced charge Q_1, for a time $\triangle t_2$; with a smaller charge Q_2, for a time $\triangle t_3$, etc. If the throttling resistance is sufficiently great, the condenser does not acquire a charge sufficiently large to operate the valve. This condition is indicated by curves $8r$ in Figs. 4B and 4C.

Figs. 4B and 4C are purely illustrative and not to scale for the valve tested. The results represented in Fig. 5 have been calculated for the measured inductance and capacity of the circuit for two values of circuit resistance. The oscillatory case was calculated with a circuit resistance of 0.6 ohm, and the critically damped case for a circuit resistance of 1.0 ohm. In both cases the inductance was 3.25×10^{-4} henries and the capacity 1200 micro-farads. The oscil-

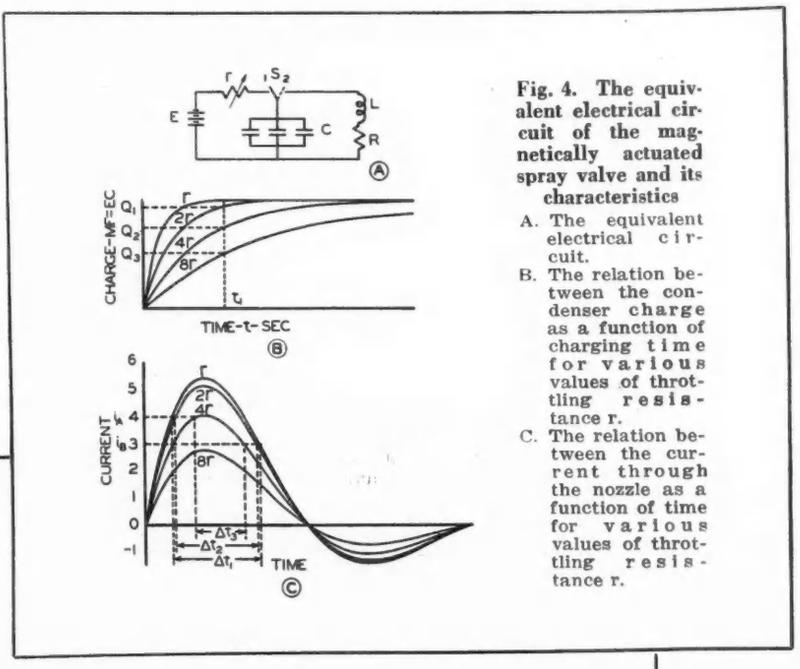


Fig. 4. The equivalent electrical circuit of the magnetically actuated spray valve and its characteristics

A. The equivalent electrical circuit.

B. The relation between the condenser charge as a function of charging time for various values of throttling resistance r.

C. The relation between the current through the nozzle as a function of time for various values of throttling resistance r.

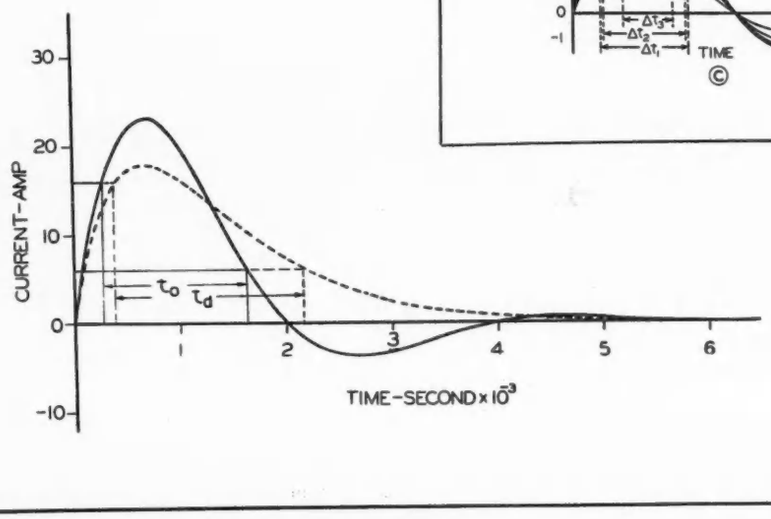


Fig. 5. The current through the nozzle as a function of time for different circuit resistances

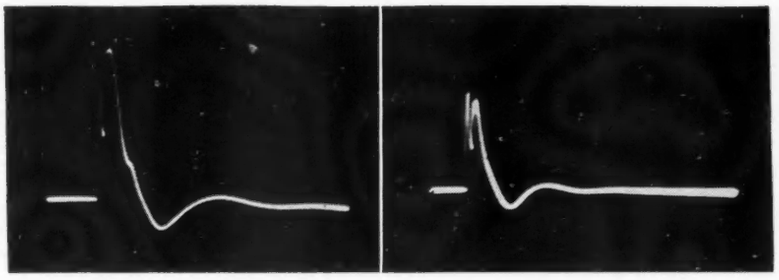


Fig. 6. Oscillograms of the current through the nozzle

A. (Left) 1300 mf condenser charge.
B. (Right) 1300 mf condenser with charge throttled to 600 mf by means of a variable resistance in the circuit.

latory circuit indicates that the period t_o the valve is open is smaller, and hence the fuel delivered at constant pressure is less, than for the case of the critically damped circuit t_d. In the oscillatory circuit the delay in nozzle opening is slightly less than for the critically damped circuit.

Fig. 5 indicates that the operating characteristics of the valve may be varied over quite a range by slight changes in the constants of the discharge circuit. For example, by increasing the voltage, decreasing the value of the rated condenser capacity, and changing the circuit resistance, the valve could be made to open twice or three times per cycle. This manner of operation would make the successive injections of the cycle decrease. Since this type of injection may not be desirable, the analysis might be considered as giving the limiting values of the constants of the circuit. On the other hand, it is often considered desirable to inject a very small charge of fuel into the cylinder before the main charge enters, thus initiating the combustion cycle. This characteristic may be obtained with the magnetically actuated valve by introducing a coupling inductance and a second tuned circuit.

Throttling, or the control of the quantity of fuel injected per cycle, is easily obtained by means of the resistance in the charging circuit. The circuit acts in an identical manner for each cycle, and since the oil pressure is maintained constant to the valve, the amount of fuel discharged and the form of the spray is very consistent for successive cycles.

A series of oscillograms taken of the current through the valve, the voltage across the valve, and the voltage across the condenser, are shown in Figs. 6, 7, and 8. The current curves show the very short delay in opening, as indicated by the nearly vertical rise of current from zero to the break in the curve. The break is due to the counter voltage

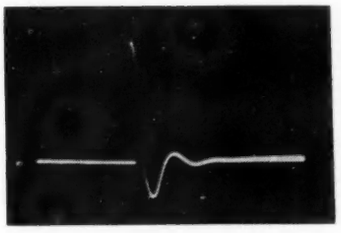


Fig. 7. Oscillogram of voltage across the valve

generated by the change in inductance resulting from the motion of the valve plunger. The point at which the needle seats is indicated by the flat part of the curve on the decreasing side of the peak.

The curve of voltage across the valve is nearly identical in form to the time rate of change of the current curve. This indicates that the resistance of the valve circuit is quite low, as compared with its inductance. The points at which the needle lifted and seated were quite distinct on the screen of the cathode ray oscillograph, but since the motion of the spot on the screen was so rapid, the resulting break is barely visible on the photographic record.

The effect of changing the throttling resistance is shown in the oscillogram of the voltage across the condenser Fig. 8. Without the throttling resistance in the circuit, the condenser charges to full voltage very rapidly and remains at constant voltage to the point of discharge. Increasing the throttling resistance requires a longer time for the condenser to reach full charge. The voltage build-up with increased resistance is shown in Fig. 8B, which also shows the small switching time from charge to discharge, as indicated by the flat portion at the top of the curve.

Spray Development

The investigation of the electrical characteristics of the magnetically actuated spray valve indicates that successive operating cycles are identical. It is desirable for smooth-engine operation that the spray be also reproducible. Therefore, knowing that the pressure at the valve is constant, it is reasonable to assume that successive sprays will be nearly identical in all respects.

In order to investigate the development of the spray, photographs were taken at intervals of one degree cam angle. This means that a complete picture of spray development represents several hundred injections, since approximately one hundred injections occurred between successive photographs. If successive

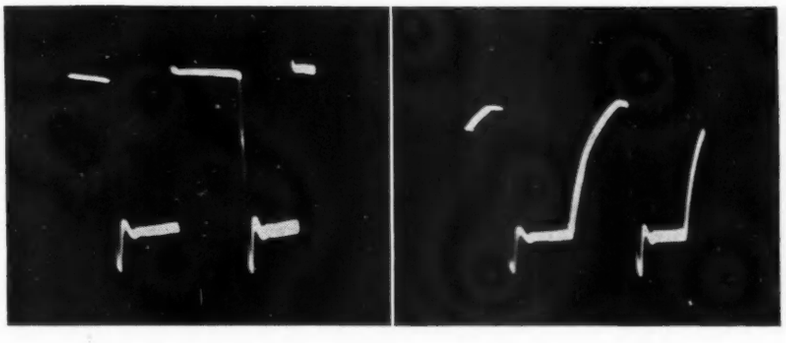


Fig. 8. Oscillograms of voltage across the condenser

A. (Left) Voltage across condenser without throttling resistance in the circuit.
B. (Right) Voltage across the condenser with throttling resistance in the circuit.

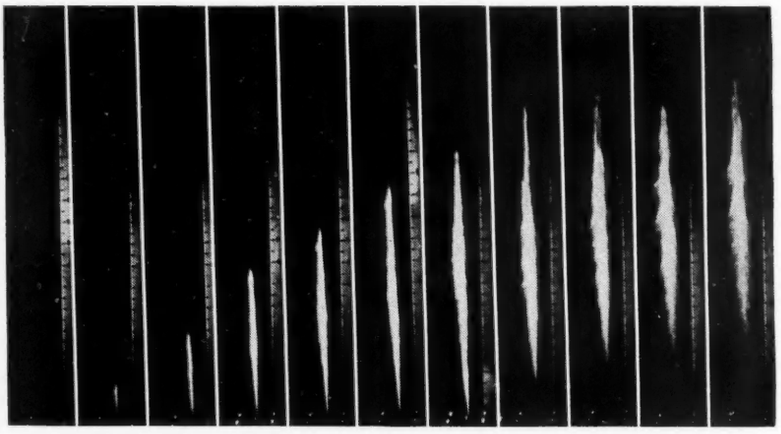


Fig. 9. The spray from a magnetically actuated spray valve. Showing the development of the spray as an average of several hundred injections

injections develop identically, then a group of photographs at uniform intervals of cam angle should appear as the development of a single spray photographed with a high-speed motion-picture camera. The results of such an investigation are shown in Fig. 9 for a cam speed of 600 r.p.m., 1300 mf. condenser capacity and 2100 lb. per sq. in. oil pressure. Certain characteristics can be followed through the development, indicating that the spray is reproducible. Furthermore, the penetration is uniform to the point of cut off, after which there is a decrease in tip velocity, due to the interruption of the core.

In contrast to the spray from the magnetically actuated valve, Fig. 10 shows the spray development from the nozzle in a jerk-pump system. The nozzle orifice and conditions of operation were the same as for the magnetically actuated valve, i. e., orifice diameter 0.022 in.; nozzle opening pressure, 2100 lb. per sq. in.; pump speed, 600 r.p.m., and pump rack setting for the same quantity of oil as delivered with the magnetically actuated valve. A fuel line 20 in. in length connected the nozzle to the pump. The influence of the dynamics of the system are evident in the successive sprays. Bouncing of the needle, possibly due to the surges in the fuel line, are particularly evident in frames 3, 4, and 8. Several frames show exceedingly small quantities of fuel in the charge, indicating that although the nozzle opening pressure is set at 2100 lb. per sq. in., the actual minimum pressure in the fuel line may be much less, or that the pump does not deliver identical quantities during successive strokes. The investigation shows very definitely that the spray from a jerk-pump system is not reproducible and that it is impossible to handle small quantities of fuel with the regularity obtained with the magnetically actuated spray valve.

Effect of Operating Characteristics on Fuel Injected

The fuel injected per cycle from the magnetically actuated spray valve should be proportional to the charge in, and the rate of discharge of, the condenser, according to the electrical analysis of the circuit. Fig. 11 shows the influence of pressure on the weight of fuel discharged for condenser capacities of 600 to 1300 mf. With constant fuel pressure, the quantity discharged increases with increase in the condenser capacity to 1100 mf., after which it is constant. For constant condenser capacity above 800 mf., and oil pressure to 4000 lb. per sq. in., the quantity of fuel discharged increases approximately as the square root of the pressure. With condenser capacities of 600 mf., the influence of fuel resistance on the valve is noticeable, in that the quantity discharged is maximum at a pressure of 2500 lb. per sq. in. These variations are of little importance to good engine operation, since the pressure for any system is constant and the charge of the condenser is manually controlled.

The effect of engine speed (or injections per minute) on the rate of discharge when the pressure is held constant is shown in Fig. 12. With low condenser charge, the quantity injected decreases with increase in engine speed. Since the condenser charge is constant, this decrease was undoubtedly due to the disturbance set up in the oil by the plunger motion. Since the needle does not move its maximum allowable distance at low condenser capacity, the increased turbulence in the valve would tend to reseat the needle, thus decreasing the charge with increased engine speed. At higher condenser capacities the charge is independent of speed over the range tested.

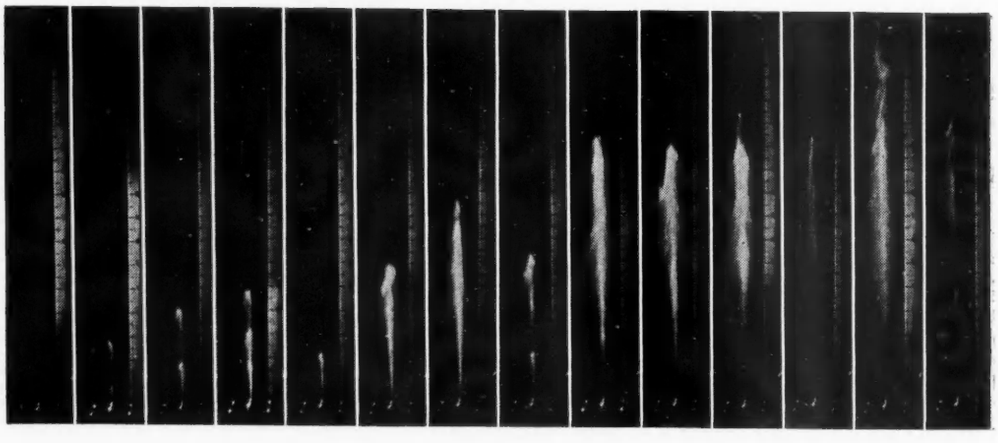


Fig. 10. The spray from the nozzle in a jerk-pump system. Showing the development of the spray as an average of several hundred injections

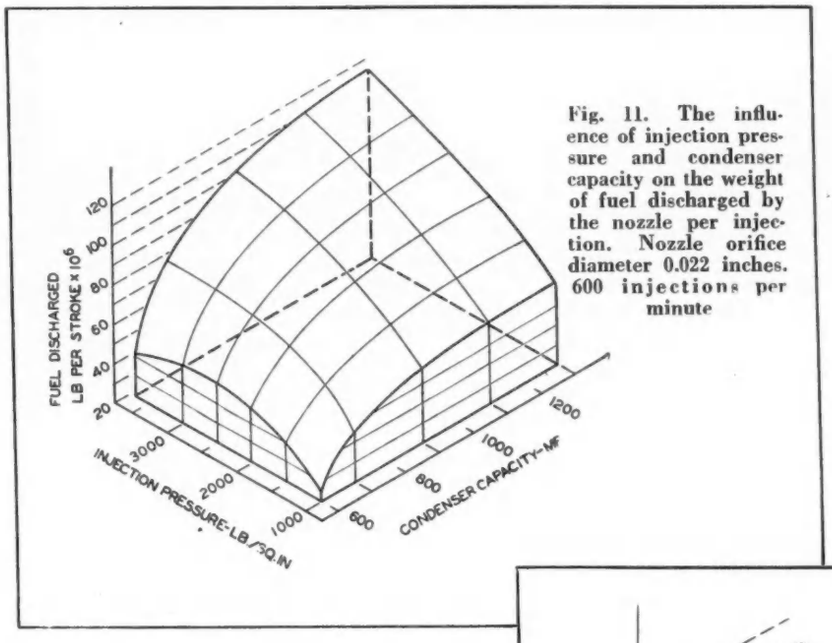


Fig. 11. The influence of injection pressure and condenser capacity on the weight of fuel discharged by the nozzle per injection. Nozzle orifice diameter 0.022 inches. 600 injections per minute

delay as indicated by the solid surface above that formed by the dotted-dashed line is the delay due to the time required to discharge the condenser through the valve circuit, and the action of the breaker points as influenced by breaker-cam speed. The results shown are referred to zero cam angle for 1000 lb. per sq. in. oil pressure and 300 r.p.m. The surface formed by the dotted-dashed line indicates the time required for the oil to start issuing from the tip of the nozzle after the needle lifted from its seat. This delay is constant with time and independent of oil pressure for the range tested. The

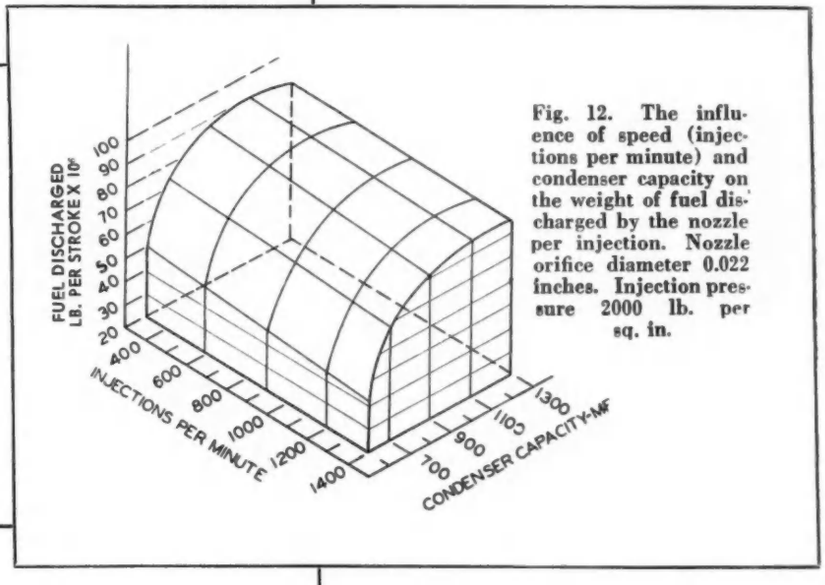


Fig. 12. The influence of speed (injections per minute) and condenser capacity on the weight of fuel discharged by the nozzle per injection. Nozzle orifice diameter 0.022 inches. Injection pressure 2000 lb. per sq. in.

Injection Delay

The injection delay as a function of oil pressure and engine speed is shown in Fig. 13. The results indicate the time (degrees cam angle) elapsed between the beginning of current flow and the initial motion of the plunger of the nozzle. The results as shown in Fig. 13 apply to all values of condenser charge. The

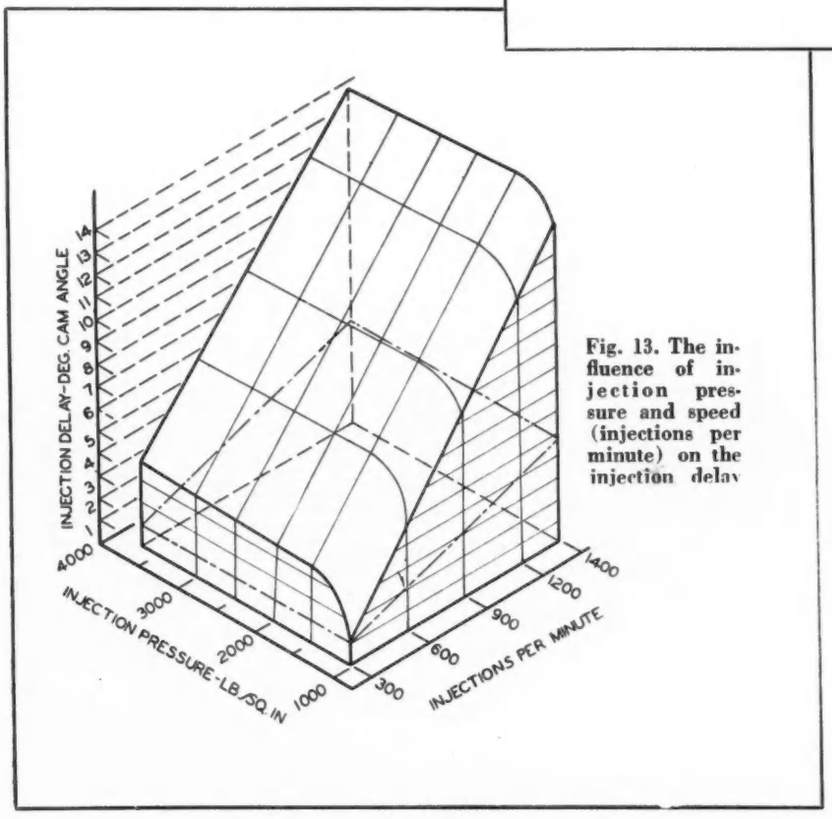


Fig. 13. The influence of injection pressure and speed (injections per minute) on the injection delay

results were obtained on the screen of the cathode-ray oscillograph with the aid of voltage curves across the valve (Fig. 7). The initial motion of the needle was indicated on the oscillogram by a definite break in the wave; a second break, or sweep, was caused at the instant the stroboscope circuit was closed. This sweep is clearly shown in Fig. 7, occurring at the instant the oil could be seen issuing from the nozzle. When the stroboscope was synchronized with the initial motion of the needle, the sweep on the oscillogram coincided with the initial break in the curve, thus allowing this portion of the injection delay to be recorded in degrees cam angle. Since the delay is —for all practical purposes—constant as a function of time, it is a simple matter to govern the system to give the proper injection advance to allow for delay of injection and combustion.

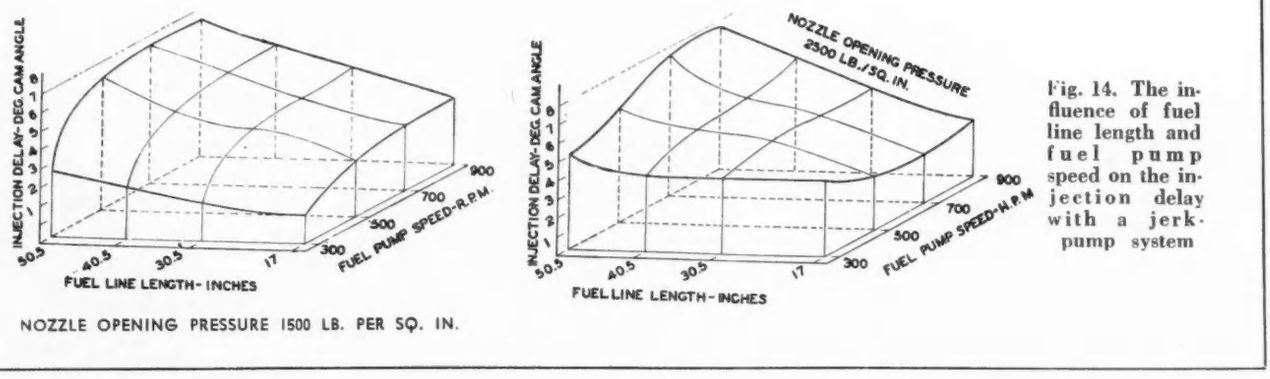

INJECTION DELAY-DEG. CAM ANGLE
FUEL LINE LENGTH-INCHES
FUEL PUMP SPEED-R.P.M.
NOZZLE OPENING PRESSURE 1500 LB. PER SQ. IN.
NOZZLE OPENING PRESSURE 2500 LB./SQ. IN.
INJECTION DELAY-DEG. CAM ANGLE
FUEL LINE LENGTH-INCHES
FUEL PUMP SPEED-R.P.M.

Fig. 14. The influence of fuel line length and fuel pump speed on the injection delay with a jerk-pump system

Figs. 14A and 14B show the variation in injection delay for the single-hole nozzle of a jerk-pump system. The influence of the dynamics of the system are evident. Since the delay is a function of the opening pressure of the nozzle it is dependent, besides other factors, upon the compressibility of the fuel. Thus fuel temperature, pressure, and viscosity play an important role.[2] These results further show the difficulties which may be encountered in engines on which various lengths of fuel lines are used for different cylinders. In brief, the possibilities of governing the jerk-pump system to control injection delay are not as simple as with the magnetically actuated spray valve in conjunction with the common-rail system.

[2] Compressibility and Velocity of Pressure Waves in Petroleum Oils. Robert Matteson. Journal of Applied Physics, Vol. 9, No. 1. January, 1938.

Summary

The magnetically actuated spray valve offers a means of accurately controlling the quantity of fuel injected per cycle. It will accurately meter smaller quantities than is possible with any mechanical system. Successive sprays are reproducible, which is a large factor in smooth engine operation. Control of the character of the spray by simple changes in the electrical circuit has great possibilities.

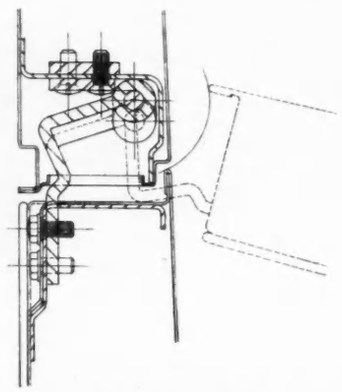
Governing of injection delay offers no complex problems, since the system is independent of the dynamics of the pump and the fuel column.

Acknowledgments

The authors are indebted to the W.P.A. (Project 8850) for assistance in collecting the data; to Lieutenants C. S. Seabring and J. R. Pierce, U. S. N., who, as graduate students at the University of California, obtained the data on injection delay with the jerk-pump system; to J. E. Gullberg of the Department of Zoology, who assisted in photographing the spray, and to the Atlas Imperial Diesel Engine Co. for the equipment tested.

New Type of Concealed Hinge

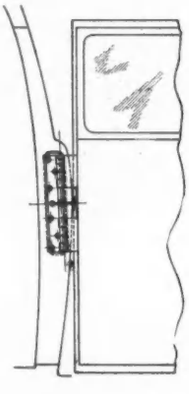
THE Metal Specialty Co., Cincinnati, Ohio, through its hinge division sales office, 409 Stephenson Bldg., Detroit, is demonstrating a new type of concealed hinge for auto bodies. As illustrated, the hinge is a simple element of heavy-gage steel, consisting of two leaves and a pin. It is located within the body pillar, where it is protected from the weather and easy to keep lubricated. Its location at the widest section of the body permits a wide latitude of body design so far as "tumble-in" or "turn-under" are concerned. A feature of the design is that the door can be made to swing either parallel to the ground, or with a minimum of lift even with an extreme tumble-in angle.



Design of Metal Specialty Co.'s concealed hinge

Production is said to be facilitated by the fact that the single hinge pin assures pin alignment and permits rapid hanging of doors on the assembly line. Door fitting is simplified by the bending adjustment inherent in the hinge.

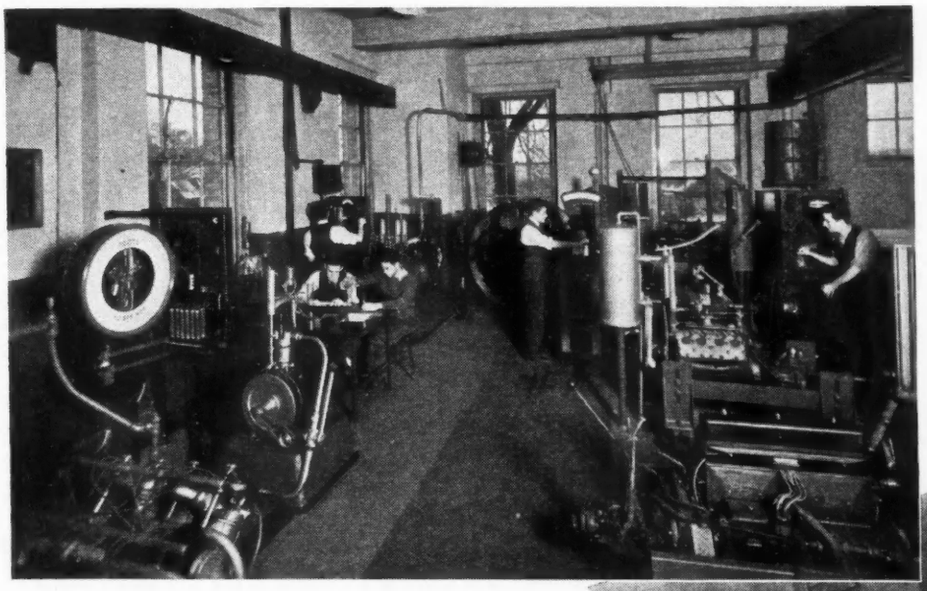
Other advantages claimed for the device are that the door check is made in combination with the hinge, and that its location is such as not to interfere with the glass run.



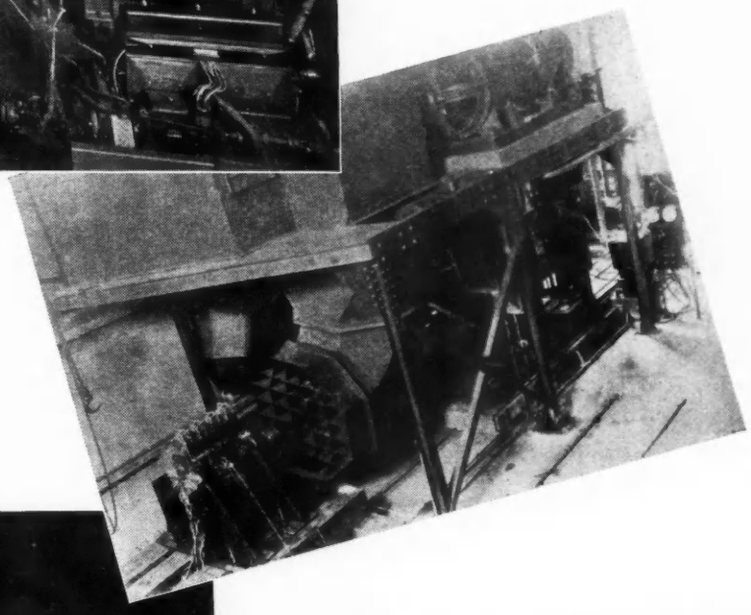
Side view of concealed hinge with door open

New York University Laboratories

(*Continued from page* 529)

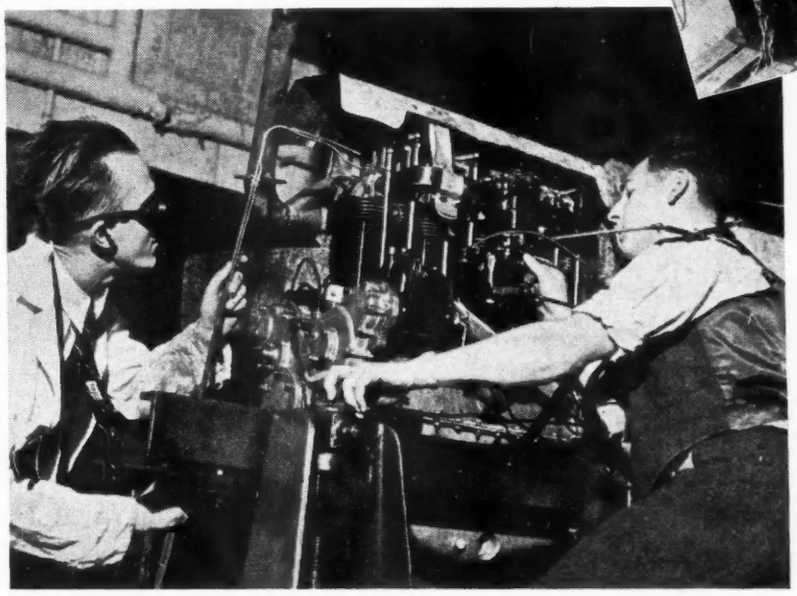


A corner of the automotive engineering laboratory



(Right) The dynamometer in the Daniel Guggenheim School of Aeronautics provided with a blower and ducts for the testing of air-cooled engines

Aircooling test being made on an aircraft engine. Air is being blown over the motor at the rate of 60 miles per hour



wind tunnel will be important pieces of equipment in the proposed study of porpoising of seaplanes.

The U. S. Civil Aeronautics Authority has approved the engine testing laboratory and its equipment which comprises three dynamometers, a single-cylinder knock-testing stand, instruments for exhaust gas analyses, and devices for determining various properties of fuels and oils. The largest dynamometer, a Sprague electric type, is capable of testing engines up to 300 hp., both air-cooled and liquid-cooled. The cooling air blast is created by a 150 hp. centrifugal blower which can deliver air at 100 m.p.h. over an area 5 ft. in diameter. In addition to r.p.m. and power readings, measurements of fuel and oil consumption, oil pressure and temperature, carburetor intake temperature, etc., can be made readily. By a system of thermocouples connected to a central multi-switch box, temperature measurements at various points on each cylinder-head are obtainable. The other two dynamometers are smaller than the Sprague.

one having a capacity of 45 hp., the other, 5 hp.

Complete tests of various engines, and special engine investigations such as spark plug tests, tests for vapor locks, transmission efficiency, etc., are made in this laboratory. The use of heavy fuel oil as a fuel instead of gasoline has also been the subject of experimentation.

Interesting sidelight on engineering education in this country is revealed in a bulletin published by New York University. It seems that engineering education for civilians was offered in the United States by only two institutions up to 1850. N. Y. U. began engineering courses in 1855, and not until 1862 was an engineering degree offered by this school. Today the undergraduate school offers four-year courses in electrical, mechanical, chemical, civil and aeronautical engineering. Advanced studies leading to a master's degree may be taken up in the graduate school in aeronautical, chemical, civil, electrical, mechanical, sanitary, and structural engineering. Doctoral degrees in aeronautical, chemical, or civil engineering may also be conferred.

This vast institution has the largest student body of any university in the United States—almost 50,000. About one-half the students attend classes in the daytime, the remainder at night. The endowment is $10,000,000; the annual operating budget exceeds $7,500,000. Certainly New York University has come a long way since its founding in 1832, when its first faculty had as its sole engineering member, Major David Bates Douglass.

Rear-Engined, Frameless Passenger Car

(*Continued from page* 525)

The general arrangement is illustrated by Figs. 7 and 8.

As already pointed out, the hollow shaft carrying the clutch throwout yoke is mounted concentric with the shafts for the gear-shifter arms. Operation of the clutch, however, may be effected hydraulically, and the mechanism employed for this purpose bears some resemblance to the operating mechanism for hydraulic brakes. As shown in Fig. 9, the clutch pedal connects to the piston of a master cylinder by means of which the operating fluid can be forced through connecting tubing to a cylinder formed in a slidable rail in the transmission housing. There is a stationary piston in this cylinder, and a passage is provided in the piston to enable the fluid from the connecting tube to pass from one side of the piston to the other. When fluid is thus displaced from one side of the piston to the other, the rail containing the cylinder is caused to move in the direction of its length, whereby the clutch is disengaged (or engaged).

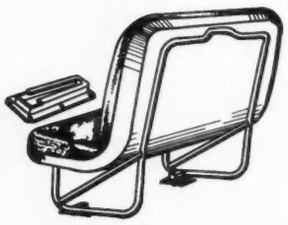


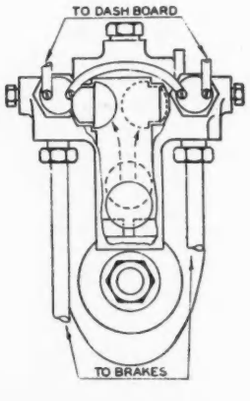
Fig. 10—Tubular-frame seat with rubber cushion

Another patent of the series covers a seat construction that is economical to manufacture, may be readily removed from the vehicle, is easy to adjust, leaves an open space between the bottom of the seat and floor, and obviates the need for a spring cushion.

Referring to Fig. 10, the seat has a supporting frame made of a single length of tubing, with lateral legs of U shape and a back support of inverted U shape. On the frame there is supported a pan having a seat portion and a back portion, the pan being provided with flanges at its edges. A rubber cushion or pillow having a large number of air pockets (sponge rubber) is cemented to the pan, and a fabric covering is cemented or adhesively secured over the rubber cushion. The adjusting means for the seat consists of a channel-shaped stamping set in a slot in the floor from underneath, the channel taking the head of a bolt with wing nut, whose shank passes through a hole in a lug welded to the inside of the base section of the tubular frame.

Hoof Brake Eyes—A New Safety Attachment

A SAFETY attachment for use in connection with hydraulic braking systems has been placed in production by Hoof Products Co., 162 N. Franklin Street, Chicago, and is being marketed under the name of Hoof Brake Eyes. It consists of two elements, one a valve connected to the master cylinder which, in the event of a leak in the lines to the front or rear brake cylinders, shuts off communication with these lines and leaves the other brakes effective. The valve comprises a neoprene ball which, when a leak develops, is forced by the



hydraulic pressure against a seat at the outlet to either the front or rear brakes, wherever the leak is located, thereby preventing further loss of brake fluid and enabling the other brakes to function normally. The other element is in the form of an indicator on the dash, with two red "eyes," the eyes flashing each time the brakes are applied. If a leak occurs and communication with that part of the system where the leak is located is shut off by the valve, the eye corresponding to it will not light, thus giving visual indication to the driver of the existence of a defect.

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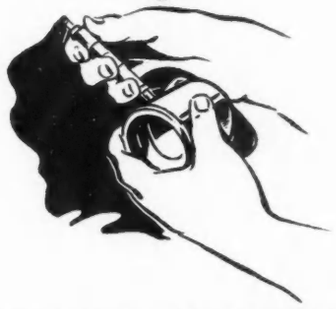

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IN THIS ISSUE . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.
Volume 80 May 1, 1939 Number 17

ON page 540 of this issue we begin a cartoon feature titled "The Brass-Hat Rack." The rather plaintive old gentleman who is having a frustrated interview with Mr. Grover Whalen in the first scene is the hero of the piece, and his adventures, ideas, and philosophy will continue to be the theme. His face (reproduced herewith) has been batting around the office for about six weeks. We have not only got accustomed to seeing it regularly, but have come to regard it rather affectionately. This affection is shared by the artist, Bo Brown, who created it especially for AUTOMOTIVE INDUSTRIES, and whose work is appearing regularly in other good magazines like *Esquire* and the *Saturday Evening Post*, and is syndicated regularly to No. 1 newspapers.

The old gentleman seems to suffer occasionally from both aphasia and amnesia, so we have never learned his real name. In the privacy of the editorial offices he is known as "Mr. Whiffle." We do know that his secretary's name is Miss Hobson, but it will be a couple of weeks or more before you can meet her.

We hope you will come to love the old gentleman as we do. So far as Miss Hobson is concerned, we feel that only a mother . . . etc.

IN the issue of Feb. 19, 1938, we ended Series II of the engineering drawings which began to appear regularly in AUTOMOTIVE INDUSTRIES beginning with the issue of Nov. 21, 1936. In this issue, we are pleased to announce the beginning of Series III of the engineering drawings which will appear regularly. (*See page* 557.)

GENERAL

Biggest Automobile Show at World's Fair — **539**

We take a brief look at the automotive significance of the sphere-and-trylon business on Long Island, and append a digest of recent industrial progress collected by Alfred P. Sloan, Jr.

PRODUCTION

Economy and Varied Requirements at Fuller — **542**

Building heavy-duty transmissions for 88 separate customers and uses is a production headache that would send many an industrial engineer to the showers. How the Fuller Mfg. Co. solves the problem is the theme of the thirty-seventh article in our series of monthly production features.

Versatility Marks Young's Production — **546**

An engineering and research department employing wind tunnel equipment and instrumentation unique in an organization of its size, is only one of the many things of interest about the Young Radiator Co., Racine, Wis. The plant and its attributes from the manufacturing point-of-view are the subject of the second article in this month's double bill of production features.

RESEARCH

So, They Built a Wind Tunnel — **554**

Which is an idea usually associated with aeronautic laboratories, but in this case it was designed to reproduce road conditions for testing radiators and other components influenced by wind and temperature. The whole job was designed and installed in the Harrison Radiator Division of General Motors, and it's the newest and largest laboratory tool in the business.

News of the Industry 567

Business in Brief 541 **Just Among Ourselves 556**

Continental Engine Drawings 557

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